

Alex. Agassiz.

Library of the Museum

OF

COMPARATIVE ZOÖLOGY,

AT HARVARD COLLEGE, CAMBRIDGE, MASS.

Founded by private subscription, in 1861.

Deposited by Alex. Agassiz
from the Library of LOUIS AGASSIZ.

No. 4892

L. Gantz

JOURNAL
OF
THE PROCEEDINGS
OF
THE LINNEAN SOCIETY.
ZOOLOGY.

VOL. II.

LONDON:
LONGMAN, BROWN, GREEN, LONGMANS & ROBERTS,
AND
WILLIAMS AND NORGATE.

1858.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

LIST OF PAPERS.

	Page
COBBOLD, T. SPENCER, M.D., F.L.S.	
Description of a New Form of Naked-Eyed Medusa (<i>Thaumatias achroa</i>), with brief histological details	38
COUCH, JONATHAN, F.L.S. &c.	
Note on the Occurrence of <i>Phyllosoma commune</i> on the Coast of Cornwall	146
FORSTER, THOMAS, M.D.	
On the Irregularity in the Return of Swallows and other Vernal Migratory Birds in the Season 1857	40
GUY, W. A., M.B.	
Note on a singular case of Colouring of the Human Hair	41
OWEN, Professor, F.R.S., V.P.L.S. &c.	
On the Characters, Principles of Division and Primary Groups of the Class Mammalia	1
SCLATER, PHILIP LUTLEY, M.A., F.L.S. &c.	
On the general Geographical Distribution of the Class Aves.	130
On the Zoology of New Guinea.	149
SMITH, FREDERICK, Assistant in the Zoological Department in the British Museum.	
Catalogue of the Hymenopterous Insects collected at Sarawak, Borneo ; Mount Ophir, Malacca ; and at Singapore, by A. R. Wallace	42
INDEX.	171

JOURNAL OF THE PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

On the Characters, Principles of Division, and Primary Groups of the Class MAMMALIA. By Professor OWEN, F.R.S., F.L.S., Superintendent of the Natural History Departments in the British Museum.

[Read February 17th and April 21st, 1857.]

THE class MAMMALIA, the most highly organized of the animal kingdom and that to which we ourselves belong, appears to have been the last class of animals introduced on this planet, and not to have attained plenary development until the tertiary division of geological time.

MAMMALS are distinguished, outwardly, by an entire or partial covering of hair, and (with two exceptions) by teats or mammæ—whence the name of the class*. All Mammals possess mammary glands, and suckle their young: the embryo or fœtus is developed in the womb. Their leading anatomical character is to have lungs, composed of a highly vascular and minutely cellular structure throughout, and suspended freely in a thoracic cavity separated by a muscular and tendinous septum or diaphragm from the abdomen.

* From *mamma*, a pap. The Platypus and Echidna are the only known exceptions to this rule. The Mare is an apparent one, from the pudendal position of the nipples. The fœtal Cetacea show tufts of hair on the muzzle.

Mammals, like Birds, have a heart composed of two ventricles and two auricles, and have warm blood: they breathe quickly; but inspiration is performed chiefly by the agency of the diaphragm; and the inspired air acts only on the capillaries of the pulmonary circulation.

The blood-discs are smaller than in Reptiles, and, save in the Camel-tribe, are circular. The right auriculo-ventricular valve is membranous, at least never entirely fleshy; and the aorta bends over the left, never over the right, bronchial tube. The primary branches of the aorta are given off not immediately after, but at a little distance from, its origin, and there is less constancy in the order of their origin than in Birds: the phrenic arteries, the cœliac axis, and the superior mesenteric artery are always branches of the abdominal aorta, which terminates by dividing beyond the kidneys into the iliac arteries, from which spring both the femoral and ischiadic branches: the caudal or sacro-median artery, which in some long-tailed Mammals assumes the character of the continued trunk of the aorta, never distributes arteries to the kidneys or the legs, as in Birds. The kidneys are nourished, and derive the material of their secretion, exclusively from the arterial system. Their veins are simple, commencing by minute capillaries in the parenchyma and terminating generally by a single trunk on each side in the abdominal vena cava: they never anastomose with the mesenteric veins.

The kidneys are relatively smaller and present a more compact figure than in the other vertebrate classes; their parenchyma is divided into a cortical and medullary portion, and the secreting tubuli terminate in a dilatation of the excretory duct, called the pelvis.

The liver is generally divided into a greater number of lobes than in Birds. The portal system is formed by veins derived exclusively from the spleen and chylopoietic viscera. The cystic duct, when it exists, always joins the hepatic, and does not enter the duodenum separately. The pancreatic duct is commonly single.

The mouth is closed by soft flexible muscular lips: the upper jaw is composed of palatine, maxillary and premaxillary bones, and is fixed; the lower jaw consists of two rami, which are simple or formed by one bony piece, and are articulated by a convex or flat condyle to the base of the zygomatic process, and not to the tympanic element of the temporal bone; the base of the coronoid process generally extends along the space between the condyloid

and the alveolar processes. The jaws of Mammals with few exceptions are provided with teeth, which are arranged in a single row; they are always lodged in sockets, and never ankylosed with the substance of the jaw. The tongue is fleshy, well-developed, with the apex more or less free. The posterior nares are protected by a soft palate, and the larynx by an epiglottis: the rings of the trachea are generally cartilaginous and incomplete behind: there is no inferior larynx. The œsophagus is continued without partial dilatations to the stomach, which varies in its structure according to the nature of the food, or the quantity of nutriment to be extracted therefrom.

The true vertebræ of Mammalia have their bodies ossified from three centres, and present for a longer or shorter period of life a discoid epiphysis at each extremity. They are articulated by concentric ligaments with interposed glairy fluid forming what are called the intervertebral substances; the articulating surfaces are generally flattened, but sometimes, as in the neck of certain Ruminants, they are concave behind and convex in front: such a vertebra, however, may be distinguished from a vertebra of a Reptile, with a similar ball-and-socket structure of the articular surfaces, even when found in a fossil state, and when the test of the articulating medium cannot be applied, by the complete ankylosis or confluence of the annular with the central part or body, and by the large relative size of the canal for the spinal chord. The cervical vertebræ, with one or two exceptions, are seven in number, neither more nor less: the Monotremes, which are the instances commonly opposed to other generalizations, form no exception to this rule. The lumbar vertebræ are more constant and usually more numerous than in other classes of vertebrate animals. The atlas is articulated by concave articular processes to two convex condyles, which are developed from the ex-occipital elements of the last cranial vertebra. The tympanic element of the temporal bone is restricted in function to the service of the organ of hearing, and never enters into the articulation of the lower jaw. The olfactory nerves escape from the cranial cavity through numerous foramina of a cribriform plate. The optic foramina are always distinct from one another.

The scapula is generally an expanded plate of bone; the coracoid, with two (monotrematous) exceptions, appears as a small process of the scapula. The sternum consists of a narrow and usually simple series of bones: the sternal portions of the ribs are generally cartilaginous and fixed to the vertebral portions without

the interposition of a distinct articulation: there are no gristly or bony abdominal ribs or abdominal sternum. The pubic and ischial arches are generally complete, and united together by bony confluence on the sternal aspect, so that the interspace of the two pelvic arches is converted into two holes, called *foramina obturatoria* or *thyroidea*. The sclerotic coat of the eye is a fibrous membrane, and never contains bony plates. In the quantity of aqueous humour and the convexity of the lens Mammals are generally intermediate between Birds and Fishes. The organ of hearing is characterized by the full development of the cochlea with a lamina spiralis: there are three distinct ossicles in the tympanum; the membrana tympani is generally concave externally; the meatus auditorius externus often commences with a complicated external ear, having a distinct cartilaginous basis. The external apertures of the organ of smell are provided with moveable cartilages and muscles, and the extent of the internal organ is increased by accessory cavities or sinuses which communicate with the passages including the turbinated bones.

There are few characters of the osseous system common, and at the same time peculiar, to the class Mammalia. The following may be cited:—

1. Each half or ramus of the mandible consists of one bony piece developed from a single centre: the condyle is convex or flat, never concave. This has proved a valuable character in the determination of fossils.

2. The second or distal bone, called “squamosal,” in the bar continued backwards from the maxillary arch, is not only expanded, but is applied to the side-wall of the cranium, and develops the articular surface for the mandible, which surface is either concave or flat*.

3. The presphenoid is developed from a centre distinct from that of the basisphenoid.

In no other class of vertebrate animals are these osteological characters present.

The cancellous texture of mammalian bone is of a finer and more delicate structure than in Reptiles, and forms a closer network than in Birds. The microscopic radiating cells are relatively smaller and approach more nearly to the spheroid form; but both these histological characters are liable to mislead, if unsupported by more obvious and constant ones, in the interpretation of a fossil.

* The Wombat is, perhaps, the sole exception to this rule.

Dental characters.—The Mammalia, like *Reptilia* and *Pisces*, include a few genera and species that are devoid of teeth; the true ant-eaters (*Myrmecophaga*), the scaly ant-eaters or pangolins (*Manis*), and the spiny monotrematous ant-eater (*Echidna*), are examples of strictly edentulous Mammals. The Ornithorhynchus has horny teeth, and the whales (*Balæna* and *Balænoptera*) have transitory embryonic calcified teeth, succeeded by whalebone substitutes in the upper jaw. The female Narwhal seems to be edentulous, but has the germs of two tusks in the substance of the upper jaw-bones; one of these becomes developed into a large and conspicuous weapon in the male Narwhal, whence the name of its genus *Monodon*.

The examples of excessive number of teeth are presented, in the order *Bruta*, by the piodont Armadillo, which has ninety-eight teeth: and in the Cetaceous order by the Cachalot, which has upwards of sixty teeth, though most of them are confined to the lower jaw; by the common Porpoise, which has between eighty and ninety teeth: by the Gangetic Dolphin, which has one hundred and twenty teeth; and by the true Dolphins (*Delphinus*), which have from one hundred to one hundred and ninety teeth, yielding the maximum number in the class Mammalia.

When the teeth are in excessive number, as in the Armadillos and Dolphins above cited, they are small, equal, or sub-equal, and usually of a simple conical form.

In most other mammals particular teeth have special forms for special uses; thus, the front teeth, from being commonly adapted to effect the first coarse division of the food, have been called cutters or *incisors*; and the back teeth, which complete its comminution, grinders or *molars*; large conical pointed teeth situated behind the incisors, and adapted, by being nearer the insertion of the biting muscles, to act with greater force, are called holders, tearers, laniaries, or more commonly *canines*, from being well developed in the Dog and other Carnivora.

It is peculiar to the class Mammalia to have teeth implanted in sockets by two or more fangs; but this can only happen to teeth of limited growth, and generally characterizes the molars and premolars: perpetually growing teeth require the base to be kept simple and widely excavated for the persistent pulp. In no mammiferous animal does anchylosis of the tooth with the jaw constitute a normal mode of attachment. Each tooth has its peculiar socket, to which it firmly adheres by the close co-adaptation of their opposed surfaces, and by the firm adhesion of the alveolar

periosteum to the organized cement which invests the fang or fangs of the tooth.

True teeth implanted in sockets are confined, in the Mammalian class, to the maxillary, premaxillary, and mandibular or lower maxillary bones, and form a single row in each. They may project only from the premaxillary bones, as in the Narwhal; or only from the lower maxillary bone, as in *Ziphius*; or be limited to the superior and inferior maxillaries and not present in the premaxillaries, as in the true *Ruminantia* and most *Bruta* (Sloths, Armadillos, Orycteropes). In most Mammals teeth are situated in all the bones above mentioned.

The teeth of the Mammalia usually consist of hard unvascular dentine, defended at the crown by an investment of enamel, and everywhere surrounded by a coat of cement.

The coronal cement is of extreme tenuity in Man, Quadrumana and the terrestrial Carnivora; it is thicker in the Herbivora, especially in the complex grinders of the Elephant.

Vertical folds of enamel and cement penetrate the crown of the tooth in the ruminating and many other Ungulata, and in most Rodents, characterizing by their various forms the genera of those orders.

No Mammal has more than two sets of teeth. In some species the tooth-matrix does not develop the germ of a second tooth, destined to succeed one into which the matrix has been converted; such a tooth, therefore, when completed and worn down, is not replaced. The Sperm Whales, Dolphins, and Porpoises are limited to this simple provision of teeth. In the Armadillos and Sloths, the want of generative power, as it may be called, in the matrix is compensated by the persistence of the matrix, and by the uninterrupted growth of the teeth.

In most other Mammalia, the matrix of the first-developed tooth gives origin to the germ of a second tooth, which sometimes displaces the first, sometimes takes its place by the side of the tooth from which it has originated.

All those teeth which are displaced by their progeny are called 'temporary,' deciduous, or milk-teeth; the mode and direction in which they are displaced and succeeded, viz. from above downwards in the upper, from below upwards in the lower, jaw, in both jaws vertically—are the same as in the Crocodile; but the process is never repeated more than once in any mammalian animal. A considerable proportion of the dental series is thus changed; the second or 'permanent' teeth having a size and form as suitable

to the jaws of the adult, as the 'temporary' teeth were adapted to those of the young animal.

Those permanent teeth, which assume places not previously occupied by deciduous ones, are always the most posterior in their position, and generally the most complex in their form. The term 'molar' or 'true molar' is restricted to these teeth. The teeth between them and the canines are called 'premolars;' they push out the milk-teeth that precede them, and are usually of smaller size and simpler form than the true molars.

Thus the class Mammalia, in regard to the times of formation and the succession of the teeth, may be divided into two groups, *monophyodonts**, or those that generate a single set of teeth; and the *diphyodonts*†, or those that generate two sets of teeth. But this dental character is not so associated with other organic characters as to indicate natural or equivalent subclasses.

In the Mammalian orders with two sets of teeth, these organs acquire fixed individual characters, receive special denominations, and can be determined from species to species. This individualization of the teeth is eminently significative of the high grade of organization of the animals manifesting it.

Originally, indeed, the names 'incisors,' 'canines,' and 'molars,' were given to the teeth, in Man and certain Mammals, as in Reptiles and Fishes, in reference merely to the shape and offices indicated by these names; but they are now used as arbitrary signs, in a more fixed and determinate sense. In some Carnivora, *e. g.* the front-teeth have broad tuberculate summits, adapted for nipping and bruising, while the principal back-teeth are shaped for cutting, and work upon each other like the blades of scissors. The front-teeth in the Elephant project from the upper jaw, in the form, size and direction of long pointed horns. In short, shape and size are the least constant of dental characters in the Mammalia; and the homologous teeth are determined, like other parts, by their relative position, by their connexions, and by their development.

Those teeth which are implanted in the premaxillary bones, and in the corresponding part of the lower jaw, are called 'incisors,' whatever be their shape or size. The tooth in the maxillary bone, which is situated at or near to the suture with the premaxillary, is the 'canine,' as is also that tooth in the lower jaw, which, in opposing it, passes in front of the upper one's crown when the

* *μόνος*, once; *φύω*, I generate; *ὁδὸν*, tooth.

† *ἔς*, twice; *φύω* and *ὁδούς*. See "Philosophical Transactions," 1850, p. 493.

mouth is closed. The other teeth of the first set are the 'deciduous molars;' the teeth which displace and succeed them vertically are the 'premolars;' the more posterior teeth, which are not displaced by vertical successors, are the 'molars' properly so called.

I have been led, chiefly by the state of the dentition in most of the early forms of both carnivorous and herbivorous Mammalia, which flourished during the eocene tertiary periods, to regard 3 incisors, 1 canine, and 7 succeeding teeth, on each side of both jaws, as the type formula of diphyodont dentition.

Three of the seven teeth may be 'premolars,' and four may be true 'molars;' or there may be four premolars, and three true molars. This difference, as I have elsewhere shown, forms a character of a secondary group or order in the mammalian class*. The essential nature of the distinction is as follows: true molars are a backward continuation of the first series of teeth; they are developed in the same primary groove of the fetal gum; they are 'permanent' because they are not pushed out by successional teeth—the 'premolars,' called 'dents de remplacement' by Cuvier. Seven teeth developed in the primary groove is, therefore, the typical number of first teeth, beyond the canines. If, as in *Didelphys*, the anterior three develop tooth-germs, which come to perfection in a 'secondary groove,' there are then 3 deciduous teeth, 3 premolars, and 4 true molars: if, as in *Gymnura*, the anterior four of the 'primary' teeth develop tooth-germs, which grow in a secondary groove, there are then 4 deciduous teeth, 4 premolars, and 3 true molars. The first true molar of the marsupial is thus seen to be the homologue of the last milk-molar of the placental.

The *Gymnure*, the Mole, and the Hog are among the few existing quadrupeds which retain the typical number and kinds of teeth. In a young Hog of ten months, the first premolar, *p. 1*, and the first molar, *m. 1*, are in place and use together with the three deciduous molars, *d. 2*, *d. 3*, and *d. 4*; the second molar, *m. 2*, has just begun to cut the gum; *p. 2*, *p. 3*, and *p. 4*, together with *m. 3*, are more or less incomplete, and will be found concealed in their closed alveoli†.

The last deciduous molar, *d. 4*, has the same relative superiority of size to *d. 3* and *d. 2*, which *m. 3* bears to *m. 2* and *m. 1*; and the

* Outlines of a Classification of the Mammalia, Trans. Zool. Soc. vol. ii. p. 330 (1839).

† I recommend this easily acquired 'subject' to the young zoologist for a demonstration of the most instructive peculiarities of the mammalian dentition. He will see that the premolars must displace deciduous molars in order to rise into place: the molars have no such relations.

crowns of *p.* 3 and *p.* 4 are of a more simple form than those of the milk-teeth, which they are destined to succeed. When the milk-teeth are shed, and the permanent ones are all in place, their kinds are indicated, in the genus *Sus*, by the following formula:—

$$i. \frac{3-3}{3-3}, \quad c. \frac{1-1}{1-1}, \quad p. \frac{4-4}{4-4}, \quad m. \frac{3-3}{3-3} = 44:$$

which signifies that there are on each side of both upper and lower jaws 3 incisors, 1 canine, 4 premolars, and 3 molars, making in all 44 teeth, each tooth being distinguished by its appropriate symbol, e. g., *p.* 1 to *p.* 4, *m.* 1 to *m.* 3. This number of teeth is never surpassed in the placental Diphyodont series.

When the premolars and the molars are below this typical number, the absent teeth are missing from the fore part of the premolar series, and from the back part of the molar series. The most constant teeth are the fourth premolar and the first true molar; and these being known by their order and mode of development, the homologies of the remaining molars and premolars are determined by *counting the molars from before backwards, e. g.* ‘one,’ ‘two,’ ‘three,’ and the premolars *from behind forwards*, ‘four,’ ‘three,’ ‘two,’ ‘one.’ The incisors are counted from the median line, commonly the foremost part, of both upper and lower jaws, outwards and backwards. The first incisor of the right side is the homotype, transversely, of the contiguous incisor of the left side in the same jaw, and vertically, of its opposing tooth in the opposite jaw; and so with regard to the canines, premolars, and molars; just as the right arm is the homotype of the left arm in its own segment, and also of the right leg of a succeeding segment. It suffices, therefore, to reckon and name the teeth of one side of either jaw in a species with the typical number and kinds of teeth, e. g. the first, second, and third incisors,—the first, second, third, and fourth premolars,—the first, second, and third molars; and of one side of both jaws in any case.

I have been induced to dwell thus long on the dental characters of the class *Mammalia*, because they have not been clearly or accurately defined in any systematic or elementary work on zoology, although an accurate formula and notation of the teeth are of more use and value in characterizing genera in this than in any other class of animals.

I next proceed to review briefly the principal primary divisions of the *Mammalia* hitherto proposed. The best authorities in Natural History have adopted different characters, drawn from different systems of organs, for the primary groups or divisions of the class *Mammalia*.

Aristotle chose the locomotive system, and divided his ΖΟΟΤΟΚΑ—the equivalent of the Linnean ΜΑΜΜΑΛΙΑ—into three sections:—1st, ΔΙΠΟΔΑ, or bipeds; 2nd, ΤΕΤΡΑΠΟΔΑ, or quadrupeds; and 3rd, ΑΠΟΔΑ, or impeds. The preponderating second group, which includes all the class save the Human-kind and the Whale-tribe, is subdivided into those with claws, and those with hoofs. The unguiculate quadrupeds are again subdivided according to the nature of their teeth; the ungulate quadrupeds, according to the divisions of their hoofs, as *e. g.* into *Polyschidæ*, or multungulates, *Dischidæ*, or bisuleates, and *Aschidæ*, or solidungulates. I need scarcely remark that this, in most respects admirable, system, would have commanded greater attention, and been now recognized as more manifestly the basis of later systems, had its immortal author more technically expressed his appreciation of the law of the subordination of characters; but he applies to each of his groups, whatever their value, the same denomination, *viz. genos*, or genus.

Ray, with a less philosophical appreciation of the extent and nature of the class *Zootoka* or *Mammalia*, arranges his equivalent group of “Viviparous Four-footed Animals” chiefly on the Aristotelian characters; the primary division being into UNGULATE and UNGUICULATE, and the subdivisions being based on locomotive and dental characters.

Linnaeus, restoring the class *Mammalia* to its Aristotelian integrity, primarily subdivides it into UNGUICULATA, UNGULATA, and MUTICA, the latter being the ‘Apoda’ of Aristotle: the secondary groups or orders are founded chiefly on modifications of the dental system.

Cuvier, adopting the same threefold primary division of the class, subdivides it into better and more naturally defined orders, according to various characters derived from the dental, the osseous, generative, and the locomotive systems.

Illiger, in primarily dividing the *Mammalia* into those with free, and those with fettered limbs—the ‘pedes exserti distincti,’ contrasted with the ‘pedes retracti obvoluti,’—made a more unequal and less natural partition than the threefold one of Aristotle; the Seals and the Whales balance all the rest of the class in the Illigerian system. The subdivisions, also, of these primary groups, based exclusively on characters of locomotion, have met with little acceptance beyond some of the schools of Germany.

De Blainville appears first, 1816, to have adopted a character from the reproductive system for the primary division of the *Mammalia*, *viz.* into the ‘Monodelphes,’ ‘Didelphes,’ and ‘Ornitho-

delphes.' His orders are in the main a return to the Linnean system and nomenclature, with some peculiar views, as *e.g.* of the quadrumanous or primatial affinity of the Sloths, which have never gained acceptance. But his system indicates a clearer appreciation or stronger conviction of the value of the character of parity and imparity in the number of toes of the *Ungulata*, first suggested by Cuvier*, than was subsequently entertained by the originator of the idea.

The position of the marsupial and monotrematous quadrupeds at the bottom of the class *Mammalia*, and the higher value assigned to the group which they constituted, than that in the 'Règne Animal' of Cuvier, were ideas also in closer conformity with nature. They were, however, but surmises, unsustained by anatomical knowledge; and, as such, failed to carry conviction, or gain acceptance. Nor was it until comparative anatomy had shown that the Marsupials and Monotremes agreed in differing from all other mammals in the absence of a placenta, and of the great commissure of the brain, in certain bird-like characters of the heart†, and from all other diphyodont Mammals in a less number of premolars, and a greater number of true molars,—depending essentially on the retention of a milk-tooth (*m.* 4), which is displaced and changed in the placental diphyodonts,—that the true affinities of the didelphid and ornithodelphid mammals to each other, and their true position in the class *Mammalia*, were finally recognized.

In the 'Systema Vertebratorum,' communicated in 1840 to the Linnean Society by that accomplished and indefatigable zoologist Prince Charles Lucien Bonaparte, the primary subdivision of the *Mammalia* according to developmental and generative characters is adopted; and the first division or series *Placentalia* is subdivided, agreeably with M. Jourdan's distribution of *Mammalia* in the Leyden Museum, into the two subclasses *Educabilia* and *Ineducabilia*, the latter including the orders *Bruta*, *Cheiroptera*, *Insectivora* and *Rodentia*, with the common character of 'cerebrum unilobum.' This I regard as the most important improvement in the classification of the *Mammalia*, which has been proposed since the establishment of the natural character of the implantental or ovo-viviparous division.

Cuvier had early noticed the relation of the Australian mammals, as a small collateral series, to the unguiculate mammals of

* Ossements Fossiles, 4to. ed. 1812, p. 9; tom. iii. ed. 1822, p. 72.

† On the Classification of the *Marsupialia*, Zoological Transactions, vol. ii. p. 315 (1839).

the rest of the world, "some," he writes, "corresponding with the *Carnaria*, some with the *Rodentia*, and others again with the *Edentata**."

M. Isidore Geoffroy St. Hilaire, in his 'Classification parallèle des Mammifères,' published in 1845, raises the *Marsupialia* to the rank of a distinct class, and literally exemplifies the idea of Cuvier by placing its subdivisions, as orders, in parallel equivalents with the orders of the *Placentalia*.

It does not appear, however, that Cuvier meant to do more than indicate certain relations of analogy; just as the relation of the pedimanous and frugivorous Marsupials to the pedimanous *Quadrumanus* of S. America, that of the marsupial Hyæna (*Thylacinus*) to the Wolf, of the Flying Petaurist to the Flying Squirrel, of the Wombat to the Beaver, of the Kangaroo to the Ruminant, of the Koala to the phytophagous Sunbear, of the Opossums to the Shrews, and of the Echidna to the Anteater, &c., had been pointed out by myself. My esteemed friend and colleague Mr. Waterhouse, whilst admitting the justness of some of these comparisons, appended a timely warning, in a valuable note in his comprehensive and excellent history of the *Marsupialia*†, against the mistake to which the young zoologist might be liable, of concluding the analogical groups of the *Marsupialia* and *Placentalia* thus indicated to be of equal rank and value. I have always participated in this conviction of the lower value of the *Implacentalia* as compared with the *Placentalia*; and have used those terms merely as useful collective or general signs of certain modifications of structure, which are associated with the development and non-development of the placenta.

In like manner, when indicating the highest generalization to which I had arrived after comparisons of the dentition of the Mammalia, by the terms 'monophyodont' and 'diphyodont‡,' signifying respectively the single and double set of teeth developed in different groups of the class, I have been careful to guard myself from being misunderstood, as supposing that the monophy-

* Règne Animal, ed. 1829, vol. i. p. 174.

† Natural History of the Mammalia, 8vo. 1845, part i. p. 14. I must remark, however, that in stating "by Prof. Owen and some other naturalists, the present section (*Marsupialia*) is ranked as a subclass," the reader, from the peculiarly extended signification given to the term 'Marsupialia,' might be misled. The *Marsupialia* form one of the orders of my subclass *Implacentalia*. See the articles 'Marsupialia' and 'Monotremata,' in the "Cyclopædia of Anatomy," vol. iii. 1841.

‡ Cyclopædia of Anatomy, part xxxvii. 1849. Phil. Trans. 1850, p. 493.

dont *Monotremata*, *Bruta*, and *Cetacea*, formed an equivalent group with the diphyodont bulk of the Mammalia, or that the binary groups, defined by this single dental character, were natural ones.

Nothing more than a passing allusion seems needed to the system of classifying the Mammalia on the modifications of the placenta, originally proposed by Sir Everard Home*, and since reproduced and modified by a few other naturalists. The group, *e.g.* associated by the character of the discoid placenta, is as little natural as that which would be composed on the basis of the diphyodont dentition, or the unguiculate feet. The association of the *Rodentia* and *Insectivora* with the *Quadrumanæ*, as in the latest modification of the placental system†, is not likely to command acceptance. The diffused placenta, as in the Mare, Porpoise, Peccari, Rhinoceros, and Camel, would lead to an equally heterogeneous assemblage. In two well-defined minor groups, *e.g.* the true *Carnivora* and the true *Ruminantia*, there exist characteristic modifications of the placenta, viz. the zonular and cotyledonal respectively; but though the zonular type is common to the *Carnivora*, it is not peculiar to them; it is that of the placenta in the Hyrax and the Elephant, amongst the *Ungulata*. So likewise the cotyledonal type characterizes the placenta of the Sloth among the *Bruta*.

Primary Divisions of the Mammalia.—The question or problem of the truly natural and equivalent primary groups of the class *Mammalia* has occupied much of my consideration, and has ever been present to my mind when gathering any new facts in the anatomy of the Mammalia, during dissections of the rarer forms which have died at the Zoological Gardens, or on other opportunities.

The peculiar value of the leading modifications of the mammalian brain, in regard to their association with concurrent modifications in other important systems of organs, was illustrated in detail in the Hunterian Course of Lectures on the Comparative Anatomy of the Nervous System, delivered by me at the Royal College of Surgeons in 1842. The ideas which were broached or suggested, during the delivery of that course, I have tested by every subsequent acquisition of anatomical knowledge, and now feel myself justified in submitting to the judgement of the Linnean Society, with a view to publication, the following fourfold primary division of the mammalian class, based upon the four leading modifications of cerebral structure in that class.

* Lectures on Comparative Anatomy, vol. iii. 4to. p. 445.

† GERVAIS, Zoologie et Paléontologie Française, 4to. 1853, p. 194.

The brain is that part of the organization which, by its superior development, distinguishes the Mammalia from all the inferior classes of VERTEBRATA; and it is that organ which I now propose to show to be the one that by its modifications marks the best and most natural primary divisions of the class.

In some mammals the cerebral hemispheres are but feebly and partially connected together by the 'fornix' and 'anterior commissure:' in the rest of the class a part called 'corpus callosum' is added, which completes the connecting or 'commissural' apparatus.

With the absence of this great superadded commissure* is associated a remarkable modification of the mode of development of the offspring, which involves many other modifications; amongst which are the presence of the bones called 'marsupial,' and the non-development of the deciduous body concerned in the nourishment of the progeny before birth, called 'placenta;' the young in all this 'implacental' division being brought forth prematurely, as compared with the rest of the class.

This first and lowest primary group, or subclass, of Mammalia may be termed, from its cerebral character, *LYENCEPHALA*†,—signifying the comparatively loose or disconnected state of the cerebral hemispheres. The size of these hemispheres (fig. 1, A) is such that they leave exposed the olfactory ganglions (a), the cerebellum (c), and more or less of the optic lobes (b); their surface is generally smooth; the anfractuositities, when present, are few and simple.

The next well-marked stage in the development of the brain is where the corpus callosum (indicated in fig. 2, by the dotted lines d, d) is present, but connects cerebral hemispheres as little advanced in bulk or outward character as in the preceding subclass; the cerebrum (A) leaving both the olfactory lobes (a) and cerebellum (c) exposed, and being commonly smooth, or with few and simple convolutions in a very small proportion, composed of the largest members of the group. The mammals so characterized constitute the subclass *LISSENCEPHALA*‡ (fig. 2).

In this subclass the testes are either permanently or temporarily concealed in the abdomen: there is a common external genito-urinary aperture in most; two precaval veins ('superior' or 'anterior venæ cavæ') terminate in the right auricle. The squamosal in most, and the tympanic in many, retain their primitive separation as distinct bones. The orbits have not an entire rim

* "On the Structure of the Brain in Marsupial Animals," Philos. Trans. 1837, p. 87.

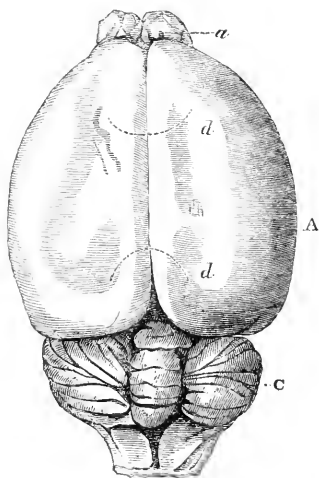
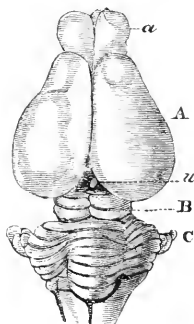
† λίω, to loose; ἐγκέφαλος, brain.

‡ λισσός, smooth; ἐγκέφαλος, brain.

of bone. Besides these more general characters by which the *Lissencephala*, in common with the *Lyencephala*, resemble Birds and Reptiles, there are many other remarkable indications of their affinity to the Oviparous Vertebrata in particular orders or genera

Fig. 2.—Brain of Beaver.

Fig. 1.—Brain of Opossum.



of the subclass. Such, *e.g.*, are the cloaca, convoluted trachea, supernumerary cervical vertebrae and their floating ribs, in the 3-toed Sloth; the irritability of the muscular fibre, and persistence of contractile power in the Sloths and some other Bruta; the long, slender, beak-like edentulous jaws and gizzard of the Anteaters; the imbricated scales of the equally edentulous Pangolins, which have both gizzard and gastric glands like the proventricular ones in birds; the dermal bony armour of the Armadillos like that of loricated Saurians; the quills of the Porcupine and Hedgehog; the proventriculus of the Dormouse and Beaver; the prevalence of disproportionate development of the hind-limbs in the *Rodentia*; coupled, in the Jerboa, with confluence of the three chief metatarsals into one bone, as in birds; the keeled sternum and wings of the Bats; the aptitude of the *Cheiroptera*, *Insectivora*, and certain *Rodentia* to fall, like Reptiles, into a state of true torpidity, associated with a corresponding faculty of the heart to circulate carbonized or black blood:—these, and the like indications of co-affinity with the *Lyencephala* to the Oviparous air-breathing Vertebrata, have mainly prevailed with me against an acquiescence

in the elevation of different groups of the Lissencephala to a higher place in the Mammalian series, and in their respective association, through some single character, with better-brained orders, according to Mammalogical systems which, at different times, have been proposed by zoologists of deserved reputation. Such, *e.g.*, as the association of the long-clawed *Bruta* with the *Ungulata**, and of the shorter-clawed Shrews, Moles and Hedgehogs, as well as the Bats, with the *Carnivora*†; of the Sloths with the *Quadrumana*‡; of the Bats with the same high order§; and of the *Insectivora* and *Rodentia* in immediate sequence after the Linnean ‘Primates,’ as in the latest published ‘System of Mammalogy,’ from a distinguished French author||.

* Macleay, Linn. Trans. vol. xvi. (1833); Gray, Dr. J. E., Mammalia in the British Museum, 12mo. 1843, p. xii.

† Cuvier, Règne Animal, 1829, p. 110.

‡ De Blainville, Ostéographie, 4to. fasc. 1. p. 47 (1839).

§ Linnæus, Systema Naturæ.

|| Prof. Gervais, Zoologie et Paléontologie Française, 4to. 1852, p. 194. This scheme is avowedly an adoption of that proposed by Professor Milne-Edwards, in the first volume of the 3rd series of the ‘Annales des Sciences Naturelles,’ 1844, in a paper entitled ‘Considérations sur quelques Principes relatifs à la Classification Naturelle des Animaux,’ &c.; in referring to which, M. Gervais states his conviction that Milne-Edwards, “a mis hors de doute les rapports des Rongeurs avec les premiers Mammifères.”—Annales des Sciences Naturelles, ser. iii. vol. i. p. 251. The high and justly-earned reputation of both these naturalists renders it incumbent on me to state the doubts with respect to the actual affinity of the Rodentia to the Quadrumana which remained on my mind after an attentive perusal of the arguments urged by Milne-Edwards. The first of these arguments is based upon an alleged resemblance of placental structure, expressed by the term “à placenta discoïde,” applied as a character to the Bimana, Quadrumana, Cheiroptera, Insectivora and Rodentia, collectively.

The degree of resemblance in outward form, between the placenta of the Rat or Hare, on the one hand, and the *Myctes* and *Macacus* on the other, seems to me to be more than counterbalanced by the difference of structure. The pedunculate and cotyloid placenta of the Rat consists of fetal parts exclusively; the maternal areolar portion is as distinct from it as it is in the cotyledon of the Ruminant, and is a persistent structure of the uterus. The discoid placenta of the Monkey includes a large proportion of maternal cellular structure, which comes away with the fetal portion. The difference in the organic interblending of the circulatory organs of mother and offspring, between the *Rodentia* and *Quadrumana*, is of much more real importance than the degree of superficial similarity. Still more significant, in regard to genetic grounds of affinity, is the great difference in the development and function of the vitelline or umbilical sac in the fetal membranes of the two orders. But, as regards outward form, the cotyloid placenta of the *Muridæ* differs more from the thin, expanded and subdivided placenta of the Hare, than it does from that of the Marmoset Monkey: then, it signifies something in the argument drawn from similarity

The third leading modification of the Mammalian cerebrum is such an increase in its relative size, that it extends over more or

of form, that there are two distinct discoid placenta in *Callithrix* as in *Cercopithecus*, *Macacus* and *Semnopithecus*; whilst in *Mycetes*, as in *Troglo-
dytes*, there is but one such placenta.

The structure of the discoid placenta in the *Pteropus*, like that of the Rat, more resembles that of the fœtal portion of the cotyledon in the Cow than that of the cellulose-vascular spongy placenta of the *Quadrumanus*; and this difference, with the more important one of the larger umbilical sac, appears to me to greatly outweigh the degree of resemblance in mere outward form of the placenta. Any argument in favour of the affinity of the *Cheiroptera* to the *Quadrumanus*, based on that degree of resemblance, must be affected by the prevalence of the double discoid placenta in the *Quadrumanus*. Since Hunter first made known that modification* in a species of *Macacus*, which, from a comparison of the fetus now preserved in the Museum of the Royal College of Surgeons, I believe to be the 'Wrinkled Baboon' of Shaw (*Macacus rhesus*, Desm.), Professor Breschet has described and figured the two separate discoid placenta in the small South American Squirrel-monkey (*Callithrix sciureus*, Kuhl), in the Green Monkey (*Cercopithecus sabæus*, Desm.), and in the Long-nosed Monkey (*Semnopithecus nasicus*). Yet this well-marked modification of the cellulose-vascular placenta is not constant in the *Quadrumanus*, or even in the primary groups of the order. In the Platyrrhines, e.g., the Howler (*Mycetes seniculus*, Kuhl) has a single placenta, and amongst the Catarrhines, I have ascertained that, in the Chimpanzee (*Troglo-
dytes niger*) the placenta is single, as in the Human subject.

The five flat placental lobes, virtually as distinct as if they were separate placenta, in the Hare, resemble more the subdivided placenta of the Sloth than the single hemispheroid pedunculate placenta of the Rat, or the flattened circular placenta of the Howler Monkey. In short, the observed differences of form in the placenta of the *Rodentia*, *Insectivora*, *Cheiroptera* and *Quadrumanus* by no means justify the use of one general term as applicable to the whole†.

The second argument for the association of the *Insectivora*, *Cheiroptera* and *Rodentia* with the *Quadrumanus* is taken from alleged conformity of cerebral structure.

"Le cerveau d'un Rongeur diffère à peine de celui d'un Insectivore; il existe aussi une ressemblance extrême entre l'encephale d'un Insectivore et celui de certains Quadrumanes;" whence it is meant to be inferred, that there is the same extreme resemblance between the brain in *Rodentia* and certain *Quadrumanus*. In my paper on the 'Brains of the Marsupialia' (Phil. Trans. 1837), I have described and figured (pl. v. p. 93) the brain of a Beaver (see fig. 2, p. 15) and that of a small Monkey (*Midas rufimanus*, fig. 3, p. 19), showing the absence of cerebral convolutions in both. As the cerebral hemispheres have since been shown to be equally smooth in other *Hapalidæ* of Isidore Geoffroy, in the Potto Lemur‡ (*Perodicticus*, Bennett), in *Microcebus*§, and with few and feeble traces of con-

* Animal Economy, 4to. 1780.

† Annales des Sciences Nat. tom. cit. p. 96.

‡ Bijdrage tot de Kennis van den Potto van Bosman, 4to. 1851, V. der Hoeven.

§ Comptes Rendus de l'Acad. des Sciences, Janvier 19, 1852.

less of the cerebellum; and generally more or less over the olfactory lobes. Save in very few exceptional cases of the smaller and inferior forms of *Quadrumania* (fig. 3), the superficies is folded into more or less numerous gyri or convolutions,—whence the name *Gyrencephala**, which I propose for the third subclass of Mammalia (fig. 4).

In this subclass we shall look in vain for those marks of affinity to the *Ovipara*, which have been instanced in the preceding subclasses. The testes are, indeed, concealed, and through an obvious

volutions in *Stenops tardigradus* (Vrolik, Rech. d'Anatomie comparée sur le genre *Stenops*, in N. Verhand. der 1ste Klasse Koninkl. Nederl. Inst. Amsterdam, Oct. 1843); there is, to that extent, in the Quadrumanous order, a superficial resemblance to the non-convoluted brains of the *Rodentia* and *Insectivora*; but it is attended by that more important difference in the form and proportions of the cerebral hemispheres, of which I express my estimate by the system of Classification proposed in the present paper.

The smooth hemispheres of the brain of the *Midas* (fig. 3, A) “extend, as in most of the *Quadrumania*, over the greater part of the cerebellum (c)” (Phil. Trans. 1837, p. 93); it resembles, in short, the brain of the Human embryo before the cerebral surface begins to be folded; whereas in the *Insectivora*, in the Beaver, and even in the Capybara, in which there are a few shallow anfractuosities, the cerebral hemispheres leave the cerebellum quite exposed.

With regard to the alleged contrast between the brains of the *Rodentia* and *Carnivora*, in the breadth of the anterior and middle part of the cerebral hemispheres, a comparison of the brains of the Beaver and Coatimondi, and of the Porcupine and the Civet Cat, leaves me entirely unable to appreciate the force of the remark.

The third argument for the high position of the *Rodentia*, *Cheiroptera* and *Insectivora* in the Mammalian scale, is deduced from some particulars of their osteology, and principally from the common presence of the clavicle in them, as contrasted with its constant absence in the *Carnivora* and *Ungulata*. The clavicle is present in all *Quadrumania*, but it is not a peculiar characteristic of the higher forms of the Mammalian class. It is much more constant in the class of Birds and Reptiles: it is present in the *Monotremes*, in *Marsupials*, and in most *Bruta*. An affinity of the *Insectivora* and of the claviculate *Rodentia* with a lower vertebrate type, might therefore be inferred from the clavicle, at least with as much reason, as with the Apes and Man. As to the shape of the articular cavity for the mandible, the *Rodentia* differ more from the *Quadrumania* in this particular than the *Carnivora* do; whilst, in respect of the size, form, and persistent individuality of the tympanic bone, the *Rodentia* plainly show their more essential relations to the oviparous type; the *Carnivora* resembling the *Quadrumania* in the early coalescence of the petro-tympanic with the squamosal elements of the temporal bone.

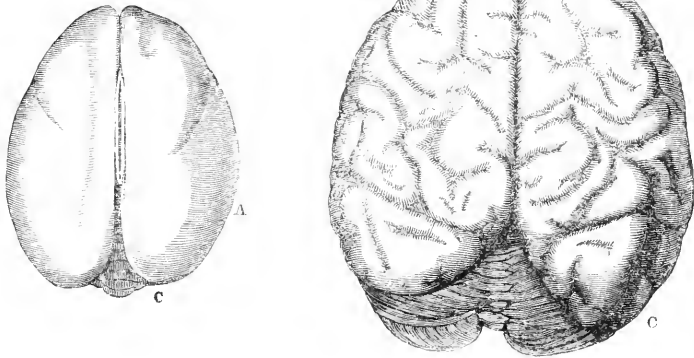
Such are some of the considerations which have induced me to set a different value than M. Gervais does, on the arguments adduced by Prof. Milne-Edwards in favour of an association of the *Rodentia* with the *Quadrumania*, in a highly placed primary group of the Mammalian class.

* γυρῶω, to bend or wind; ἐγκέφαλος, brain.

adaptive principle, in the Cetacea ; but, in the rest of the sub-class, with the exception of the Elephants, they pass out of the abdomen, and the Gyrencephalous quadrupeds, as a general rule, have a scrotum. The vulva is externally distinct from the anus. With

Fig. 1.—Chimpanzee.

Fig. 3.



the exception, again, of the Elephants, the blood from the head and anterior limbs is returned to the right auricle by a single precaval trunk. The mammalian modification of the Vertebrate type attains its highest physical perfections in the *Gyrencephala*, as manifested by the bulk of some, by the destructive mastery of others, by the address and agility of a third order. And, through the superior psychological faculties—an adaptive intelligence predominating over blind instinct—which are associated with the higher development of the brain, the *Gyrencephala* afford those species which have ever formed the most cherished companions and servitors, and the most valuable sources of wealth and power, to Mankind.

In Man the brain presents an ascensive step in development, higher and more strongly marked than that by which the preceding subclass was distinguished from the one below it. Not only do the cerebral hemispheres (figs. 5 & 6, A) overlap the olfactory lobes and cerebellum, but they extend in advance of the one, and further back than the other (fig. 6, c). Their posterior development is so marked, that anatomists have assigned to that part the character of a third lobe ; it is peculiar to the genus *Homo*, and

equally peculiar is the 'posterior horn of the lateral ventricle,' and the 'hippocampus minor,' which characterize the hind lobe of each hemisphere. The superficial grey matter of the cerebrum, through the number and depth of the convolutions, attains its maximum of extent in Man.

Peculiar mental powers are associated with this highest form of brain, and their consequences wonderfully illustrate the value of the cerebral character; according to my estimate of which, I am led to regard the genus *Homo*, as not merely a representative of a distinct order, but of a distinct subclass of the Mammalia*, for which I propose the name of '*ARCHENCEPHALA* †' A (fig. 6).

With this preliminary definition of the organic characters, which appear to

Fig. 5.—Negro.

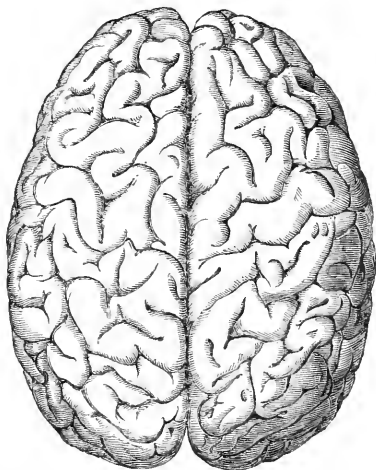
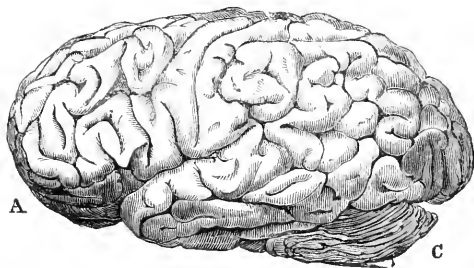


Fig. 6.—Side view, Negro.



* Not being able to appreciate, or conceive of the distinction between the psychical phenomena of a Chimpanzee and of a Boshisman, or of an Aztec with arrested brain-growth, as being of a nature so essential as to preclude a comparison between them, or as being other than a difference of degree, I cannot shut my eyes to the significance of that all-pervading similitude of structure—every tooth, every bone, strictly homologous,—which makes the determination of the difference between *Homo* and *Pithecus* the anatomist's difficulty. And, therefore, with every respect for the Author of the "Records of Creation" (8vo, 1816, pp. 18-21), I follow Linnæus and Cuvier in regarding mankind as a legitimate subject of zoological comparison and classification.

† ἀρχω, to overrule; ἐγκέφαλος, brain.

guide to a conception of the most natural primary groups of the class *Mammalia*, I next proceed to define the groups of secondary importance, or the subdivisions of the foregoing sub-classes.

In the *Lyencephalous Mammalia* some have the 'optic lobes' simple, others partly subdivided, or complicated by accessory ganglions, whence they are called 'bigeminal bodies.' The *Lyencephala* with simple optic lobes are 'edentulous' or without calcified teeth, are devoid of external ears, scrotum, nipples, and marsupial pouch: they are true 'testiconda;' they have a coracoid bone extending from the scapula to the sternum, and also an epicoracoid and episternum, as in *Lizards*; they are unguiculate and pentadactyle, with a supplementary tarsal bone supporting a perforated spur in the male. The order so characterized is called '*MONOTREMATA*,' in reference to the single excretory and generative outlet, which, however, is by no means peculiar to them among *Mammalia*. The *Monotremes* are insectivorous, and are strictly limited to Australia and Tasmania.

The *MARSUPIALIA* are Mammals distinguished by a peculiar pouch or duplicature of the abdominal integument, which in the males is everted, forming a pendulous bag containing the testes; and in the females is inverted, forming a hidden pouch containing the nipples and usually sheltering the young for a certain period after their birth: they have the marsupial bones in common with the *Monotremes*; a much-varied dentition, especially as regards the number of incisors, but usually including 4 true molars; and never more than 3 premolars*: the angle of the lower jaw is more or less inverted†.

With the exception of one genus, *Didelphys*, which is American, and another genus *Cuscus*, which is Malayan, all the known existing Marsupials belong to Australia, Tasmania, and New Guinea. The grazing and browsing Kangaroos are rarely seen abroad in full daylight, save in dark rainy weather. Most of the Marsupialia are nocturnal. Zoological wanderers in Australia, viewing its plains and scanning its scrubs by broad daylight, are struck by the seeming absence of mammalian life; but during the brief twilight and dawn, or by the light of the moon, numerous forms are seen to

* "Outlines of a Classification of the Marsupialia," Trans. Zool. Soc. vol. ii. 1839.

† For other Osteological and Dental characteristics of the Marsupialia, see the paper above cited, and that "On the Osteology of the Marsupialia," Trans. Zool. Soc. vol. ii. p. 379 (1838).

emerge from their hiding-places and illustrate the variety of marsupial life with which many parts of the continent abound. We may associate with their low position in the mammalian scale the prevalent habit amongst the Marsupialia of limiting the exercise of the faculties of active life to the period when they are shielded by the obscurity of night.

The Lissencephala or smooth-brained Placentals form a group which I consider as equivalent to the Lyencephala or Implacentals; and which includes the following orders, *Rodentia*, *Insectivora*, *Cheiroptera* and *Bruta*. The RODENTIA are characterized by two large and long curved incisors in each jaw, separated by a wide interval from the molars; and these teeth are so constructed, and the jaw is so articulated, as to serve in the reduction of the food to small particles by acts of rapid and continued gnawing, whence the name of the order. The orbits are not separated from the temporal fossæ. The testes pass periodically from the abdomen into a temporary scrotum, and are associated with prostatic and vesicular glands. The placenta is commonly discoid, but is sometimes a circular mass (Cavy), or flattened and divided into three or more lobes (Lepus). The Beaver and Capybara are now the giants of the order, which chiefly consists of small, numerous, prolific and diversified unguiculate genera, subsisting wholly or in part on vegetable food. Some Rodents, *e. g.* the Lemmings, perform remarkable migrations, the impulse to which, unchecked by dangers or any surmountable obstacles, seems to be mechanical. Many Rodents build very artificial nests, and a few manifest their constructive instinct in association. In all these inferior psychical manifestations we are reminded of Birds. Many Rodents hibernate like Reptiles. They are distributed over all continents.

The transition from the Marsupials to the Rodents is made by the Wombats; and the transition from the Marsupials is made, by an equally easy step, through the smaller Opossums to the INSECTIVORA. This term is given to the order of small smooth-brained Mammals, the molar teeth of which are bristled with cusps, and are associated with canines and incisors: they are unguiculate, plantigrade, and pentadactyle, and they have complete clavicles. The testes pass periodically from the abdomen into a temporary scrotum, and are associated with large prostatic and vesicular glands: like most other *Lissencephala*, the Insectivora have a discoid or cup-shaped placenta. Their place and office in South America and Australia are fulfilled by Marsupialia; but true Insectivora exist in all the other continents.

The order CHEIROPTERA, with the exception of the modification of their digits for supporting the large webs that serve as wings, repeat the chief characters of the Insectivora; but a few of the larger species are frugivorous and have corresponding modifications of the teeth and stomach. The mammae are pectoral in position, and the penis is pendulous in all Cheiroptera. The most remarkable examples of periodically torpid Mammals are to be found in the terrestrial and volant Insectivora. The frugivorous Bats differ much in dentition from the true Cheiroptera, and would seem to conduct through the Colugos or Flying Lemurs, directly to the Quadrumanous order. The Cheiroptera are cosmopolitan.

The order BRUTA, called *Edentata* by Cuvier, includes two genera which are devoid of teeth; the rest possess those organs, which, however, have no true enamel, are never displaced by a second series, and are very rarely implanted in the premaxillary bones. All the species have very long and strong claws. The ischium as well as the ilium unites with the sacrum; the orbit is not divided from the temporal fossa. I have already adverted to the illustration of affinity to the oviparous Vertebrata which the Three-toed Sloths afford by the supernumerary cervical vertebrae supporting false ribs and by the convolution of the windpipe in the thorax; and I may add that the unusual number—three and twenty pairs—of ribs, forming a very long dorsal, with a short lumbar, region of the spine in the Two-toed Sloth, recalls a laceratine structure. The same tendency to an inferior type is shown by the abdominal testes, the single cloacal outlet, the low cerebral development, the absence of medullary canals in the long bones in the Sloths, and by the great tenacity of life and long-enduring irritability of the muscular fibre, in both the Sloths and Ant-eaters*.

The order Bruta is but scantily represented at the present period. One genus, *Manis* or Pangolin, is common to Asia and Africa; the *Orycteropus* is peculiar to South Africa; the rest of

* This latter vital character attracted the notice of the earliest observers of these animals. Thus Maregrave and Piso narrate of the Sloth:—"Cor motum suum validissimè retinebat, postquam exemptum erat e corpore per semihorium:—exempto corde cæteris visceribus, multò post se movebat et pedes lentè contrahebat sicut dormituriens solet." Buffon, who quotes the above from the 'Historia Naturalis Brasiliæ,' p. 322, well remarks, "Par ces rapports, ce quadrupède se rapproche non seulement de la tortue, dont il a la lenteur, mais encore des autres reptiles et de tous ceux qui n'ont pas un centre du sentiment unique et bien distinct."—Hist. Naturelle, 4to, tom. xiii. p. 45.

the order, consisting of the genera *Myrmecophaga*, or true Ant-eaters, *Dasybus* or Armadillos, and *Bradypus* or Sloths, are confined to South America.

Having defined the orders or subdivisions of the two foregoing subclasses, I may remark that the *Lyencephala* cannot be regarded as equivalent merely to one of the orders, say *Rodentia*, of the *Lissancephala*, without undervaluing the anatomical characters which are so remarkable and distinct in the marsupial and monotrematous animals. The anatomical peculiarities of the edentulous *Lyencephala** appear to me to be, at least, of ordinal importance. In these deductions I hold the mean between those who, with Geoffroy St. Hilaire, would make of the *Monotremata* a distinct class of animals, or with De Blainville, a distinct subclass (*Ornithodelphes*) of Mammals†, and those who, with Cuvier, would make the Monotremes a mere family of the *Edentata*, or, with Mr. Waterhouse, a family of the *Marsupiatæ*‡. In like manner, whilst I regard the *Lyencephala* (*Marsupiatæ* of Waterhouse) as forming a group of higher rank than an order, I do not consider it as forming an equivalent primary group to that formed by all the placental Mammalia.

It appears to me that the true value of the *Lyencephala* or *Implacentalia* is that of one of four primary divisions or subclasses of the Mammalia; that its true equivalency is with the *Lissancephala*, and that all its analogical relations are to be found more truly in that smooth-brained subclass than in the *Placentalia* at large.

The following Table exemplifies the correspondence of the groups in the *Lyencephalous* and *Lissancephalous* series:—

LYENCEPHALA.	LISSENCEPHALA.
<i>Rhizophaga</i> §	Burrowing <i>Rodentia</i> .
<i>Poëphaga</i> §	<i>Dipodidæ</i> and <i>Leporidæ</i> .
<i>Petaurus</i>	<i>Pteromys</i> .
<i>Phalangistidæ</i>	<i>Sciuridæ</i> and prehensile-tailed arboreal Rodents.
<i>Phascolaretos</i>	<i>Bradypus</i> .
<i>Perameles</i> and <i>Myrmecobius</i>	<i>Erinaceidæ</i> .
<i>Chæropus</i>	<i>Macroscelis</i> .

* See my article *Monotremata*, in the *Cyclopædia of Anatomy*, part xxvi. 1841.

† *Ostéographie*, fascicule premier, 4to, 1839, p. 47.

‡ *Nat. Hist. of Mammalia*, part i. 1845, p. 18.

§ See the 'Classification of the Marsupialia,' in the *Zoological Transactions*, vol. ii. p. 232.

LYENCEPHALA.

LISSENCEPHALA.

Didelphys and *Phascogale* . . *Soricidæ*.

Dasyuridæ *Centetes*, *Gymnura*.

Echidna *Manis*.

Ornithorhynchus *Orycteropus*.

The classification proposed by M. Gervais, already cited (p. 16), in which the *Rodentia*, *Cheiroptera*, and *Insectivora* are associated in the same high primary group with the *Quadrumanæ* and *Bimana*, is avowedly adopted from that previously proposed by Prof. Milne-Edwards*.

In next proceeding to consider the subdivisions of the Gyrencephala, we seem at first to descend in the scale in meeting with a group of animals in that subclass, having the form of Fishes; but a high grade of mammalian organization is masked beneath this form. The Gyrencephala are primarily subdivided, according to modifications of the locomotive organs, into three series, for which the Linnean terms may well be retained; viz. *Mutilata*, *Ungulata* and *Unguiculata*, the maimed, the hoofed, and the clawed series.

These characters can only be applied to the Gyrencephalous subclass; *i. e.* they do not indicate natural groups, save in that section of the Mammalia. To associate the Lyencephala and Lissencephala with the unguiculate Gyrencephala into one great primary group, as in the Mammalian systems of Ray, Linnæus and Cuvier, is a misapplication of a solitary character akin to that which would have founded a primary division on the discoid placenta or the diphyodont dentition. No one has proposed to associate the unguiculate Bird or Lizard with the unguiculate Ape; and it is but a little less violation of natural affinities to associate the Monotremes with the Quadrumanes in the same primary (unguiculate) division of the Mammalian class.

The three primary divisions of the Gyrencephala are of higher value than the ordinal divisions of the Lissencephala; just as those orders are of higher value than the representative families of the Marsupials.

The *Mutilata*, or the maimed Mammals with folded brains, are so called because their hind-limbs seem, as it were, to have been amputated; they possess only the pectoral pair of limbs, and these in the form of fins: the hind end of the trunk expands into a broad, horizontally flattened, caudal fin. They have large brains with many and deep convolutions, are naked, and have neither neck, scrotum, nor external ears.

* See note at p. 16.

The first order, called CETACEA, in this division are either edentulous or monophyodont, and with teeth of one kind and usually of simple form. They are testiconda and have no 'vesiculæ seminales.' The mammæ are pudendal; the placenta is diffused; the external nostrils—single or double—are on the top of the head, and called spiracles or "blow-holes." They are marine, and, for the most part, range the unfathomable ocean; though with certain geographical limits as respects species. They feed on fishes or marine animals.

The second order, called SIRENTIA, have teeth of different kinds, incisors which are preceded by milk-teeth, and molars with flattened or ridged crowns, adapted for vegetable food. The nostrils are two, situated at the upper part of the snout; the lips are beset with stiff bristles; the mammæ are pectoral; the testes are abdominal, as in the Cetacea, but are associated with vesiculæ seminales. The Sirentia exist near coasts or ascend large rivers; browsing on fuci, water plants or the grass of the shore. There is much in the organization of this order that indicates its affinity to members of the succeeding division.

In the *Ungulata* the four limbs are present, but that portion of the toe which touches the ground is incased in a hoof, which blunts its sensibility and deprives the foot of prehensile power. With the limbs restricted to support and locomotion, the Ungulata have no clavicles: the fore-leg remains constantly in the state of pronation, and they feed on vegetables.

A particular order, or suborder, of this group is indicated by certain South American genera, *e. g.* *Toxodon* and *Nesodon**, with long, curved, rootless teeth, having a partial investment of enamel, and with certain peculiarities of cranial structure: the name TOXODONTIA is proposed for this order, all the representatives of which are extinct.

A second remarkable order, most of the members of which have, also, passed away, is characterized by two incisors in the form of long tusks; in one genus (*Dinotherium*) projecting from the under jaw, in another genus (*Elephas*) from the upper jaw, and in some of the species of a third genus (*Mastodon*), from both jaws. There are no canines; the molars are few, large and transversely ridged; the ridges sometimes few and mammillate, often numerous and with every intermediate gradation. The nose is prolonged into a cylindrical trunk, flexible in all directions, highly sensitive, and terminated by a prehensile appendage like a finger: on this organ

* Philosophical Transactions, 1853, p. 291.

is founded the name *PROBOSCIDIA* given to the order. The feet are pentadactyle, but are indicated only by divisions of the hoof; the testes are abdominal; the placenta is annular*; the mammae are pectoral.

Both the present and preceding orders of *Ungulata* may be called aberrant: the dentition of the *Toxodon*, and several particulars of the organization of the Elephant, indicate an affinity to the Rodentia; the cranium of the *Toxodon*, like that of the *Dinotherium*, resembles that of the *Sirenia* in its remarkable modifications.

The typical Ungulate quadrupeds are divided, according to the odd or even number of the toes, into *PERISSODACTYLA* and *ARTIODACTYLA*†. In the perissodactyle or odd-toed Ungulata—odd-toed at least in regard to the hind-foot,—the dorso-lumbar vertebrae differ in number in different species, but are never fewer than twenty-two; the femur has a third trochanter; and the medullary artery does not penetrate the fore-part of its shaft. The fore-part of the astragalus is divided into two very unequal facets. The os magnum and the digitus medius which it supports are large, in some disproportionately so, and the digit is symmetrical: the same applies to the ectocuneiform and the digit which it supports in the hind-foot. If the species be horned, the horn is single; or, if there be two, they are placed on the median line of the head, one behind the other, each being thus an odd horn. The nasals expand posteriorly. There is a well-developed post-tympanic process which is separated by the true mastoid from the paroccipital in the Horse, but unites with the lower part of the paroccipital in the Tapir, and seems to take the place of the mastoid in the Rhinoceros and Hyrax. The hinder half, or a larger proportion of the palatines enters into the formation of the posterior nares, the oblique aperture of which commences in advance either of the last molar, or, as in most, of the penultimate one. The pterygoid process has a broad and thick base, and is perforated lengthwise by the ectocarotid. The crown of from one to three of the hinder premolars is as complex as those of the molars‡: that of the last lower milk-molar is commonly bilobed. To these osteological and dental characters may be added some important modifications of internal structure, as, *e.g.* the simple form of the stomach and the capacious and sacculated

* Besides the annular placenta there is a subcircular villous patch at each pole of the chorionic bag, by which it derived additional attachment to the uterus, in the Elephant.

† From *περισσοδάκτυλος*, qui digitos habet impares numero; and *ἄρτιος*, par, *ἑάκτυλος*, digitus.

‡ The extinct *Lophiodonts* form the sole known exception to this rule.

cæcum, which equally evince the mutual affinities of the odd-toed or perissodactyle hoofed quadrupeds, and their claims to be regarded as a natural group of the *Ungulata*. The placenta is replaced by a diffused vascular villosity of the chorion in all the recent genera of this order, excepting the little *Hyrax*, in which there is a localised annular placenta, as in the Elephant. But the diffused placenta occurs in some genera of the next group, showing the inapplicability of that character to exact classification. Many extinct genera, *e. g.* *Coryphodon*, *Pliolophus*, *Lophiodon*, *Tapirotherium*, *Palæotherium*, *Ancitherium*, *Hipparion*, *Acerotherium*, *Elasmotherium*, &c., have been discovered, which once linked together the now broken series of Perissodactyles, represented by the existing genera *Rhinoceros*, *Hyrax*, *Tapirus*, and *Equus*.

In the even-toed or 'artiodactyle' Ungulates, the dorso-lumbar vertebræ are the same in number, as a general rule, in all the species, being nineteen. The recognition of this important character appears to have been impeded by the variable number of moveable ribs in different species of the Artiodactyles, the dorsal vertebræ, which those ribs characterize, being fifteen in the Hippopotamus and twelve in the Camel. And the value of this distinction has been exaggerated owing to the common conception of the ribs as special bones distinct from the vertebræ, and their non-recognition as parts of a vertebra equivalent to the neurapophyses and other autogenous elements. The vertebral formulæ of the Artiodactyle skeletons show that the difference in the number of the so-called dorsal and lumbar vertebræ does not affect the number of the entire dorso-lumbar series: thus, the Indian Wild Boar has *d.* 13, *l.* 6=19; the Domestic Hog and the Peccari have *d.* 14, *l.* 5=19; the Hippopotamus has *d.* 15, *l.* 4=19; the Gnu and Aurochs have *d.* 14, *l.* 5=19; the Ox and most of the true Ruminants have *d.* 13, *l.* 6=19; the aberrant Ruminants have *d.* 12, *l.* 7=19. The natural character and true affinities of the Artiodactyle group are further illustrated by the absence of the third trochanter in the femur, and by the place of perforation of the medullary artery at the fore and upper part of the shaft, as in the Hippopotamus, the Hog, and most of the Ruminants. The fore part of the astragalus is divided into two equal or sub-equal facets: the os magnum does not exceed, or is less than, the unciforme in size, in the carpus; and the ectocuneiform is less, or not larger, than the cuboid, in the tarsus. The digit answering to the third in the pentadactyle foot is unsymmetrical, and forms, with that answering to the fourth, a symmetrical

pair. If the species be horned, the horns form one pair or two pairs; they are never developed singly, of symmetrical form, from the median line. The post-tympanic does not project downward distinctly from the mastoid, nor supersede it in any Artiodactyle; and the paroccipital always exceeds both those processes in length. The bony palate extends further back than in the Perissodactyles; the hinder aperture of the nasal passages is more vertical and commences posterior to the last molar tooth. The base of the pterygoid process is not perforated by the ectocarotid artery. The crowns of the premolars are smaller and less complex than those of the true molars, usually representing half of such crown. The last milk-molar is trilobed.

To these osteological and dental characters may be added some important modifications of internal structure, as, *e.g.* the complex form of the stomach in the Hippopotamus, Peccari, and Ruminants; the comparatively small and simple cæcum and the spirally folded colon in all Artiodactyles, which equally indicate the mutual affinities of the even-toed hoofed quadrupeds, and their claims to be regarded as a natural group of the *Ungulata*. The placenta is diffused in the Camel-tribe and non-ruminants; is cotyledonal in the true Ruminants. Many extinct genera, *e.g.* *Chæropotamus*, *Anthracotherium*, *Hyopotamus*, *Entelodon*, *Dichodon*, *Merycopotamus*, *Xiphodon*, *Dichobune*, *Anoplotherium*, *Microtherium*, &c., have been discovered, which once linked together the now broken series of Artiodactyles, represented by the existing genera, *Hippopotamus*, *Sus*, *Dicotyles*, *Camelus*, *Auchenia*, *Moschus*, *Camelopardalis*, *Cervus*, *Antilope*, *Ovis*, and *Bos*.

A well-marked, and at the present day very extensive subordinate group of the Artiodactyles, is called *Ruminantia*, in reference to the second mastication to which the food is subject after having been swallowed; the act of rumination requiring a peculiarly complicated form of stomach. The Ruminants have the 'cloven foot,' *i. e.* two hoofed digits on each foot forming a symmetrical pair, as by the cleavage of a single hoof; in most species two small supplementary hoofed toes are added. The metacarpals of the two functional toes coalesce to form a single 'cannon-bone,' as do the corresponding metatarsals. The Camel-tribe have the upper incisors reduced to a single pair; in the rest of the Ruminants the upper incisors are replaced by a callous pad. The lower canines are contiguous, and, save in the Camel-tribe, similar to the six lower incisors, forming part of the same terminal series of eight teeth, between which and the molar series there is a wide

interval. The true molars have their grinding surface marked by two double crescents, the convexity of which is turned inwards in the upper and outwards in the under jaw.

Many fossil Artiodactyles, with similar molars, appear to have differed from the Ruminants chiefly by retaining structures which are transitory and embryonic in most existing Ruminants, as, *e. g.* upper incisors and canines*, first premolars, and separate metacarpal and metatarsal bones; these are among the lost links that once connected more intimately the Ruminants with the Hog and Hippopotamus.

The Pachyderms in the Cuvierian system included all the non-ruminant hoofed beasts; they were divided by the great French anatomist into the *Proboscidea*, *Solidungula*, and *Pachydermata ordinaria*, the latter again being subdivided according to the odd or even number of the hoofs. I have on another occasion† adduced evidence to show that the right progression of the affinities of the *Ungulata* was broken by the interposition of the Horse and other Perissodactyles between the non-ruminant or omnivorous and ruminant Artiodactyles; and that too high a value had been assigned to the Ruminantia by making them equivalent to all the other Ungulates collectively‡.

* In a new-born Dromedary (*Camelus Dromedarius*, L.), which perished in the birth at the London Zoological Gardens, the following was the state of the dentition. In the upper jaw there were six deciduous incisors (3—3), which were calcified, and presented a larger proportional size than any rudiments of those teeth that have been noticed in ordinary Ruminants, and they leave conspicuous alveoli in the premaxillaries: the deciduous canine and first functional milk-molar (*d.* 2) were small, the latter with a simple crown; the second (*d.* 3) and third (*d.* 4) molars were large, bilobed, and each lobe was birescentic. In the lower jaw the six incisors and two canines form a semicircular series of nearly equal teeth, with overlapping leaf-shaped crowns, the deciduous canines more resembling the incisors than the permanent ones do: the functional molars are but two in number, on each side; the first is small, simple, conical, compressed, notched behind; the second is very large and three-lobed, each lobe being birescentic, and the last the largest. Only the summits of the crescents of the molar teeth had pierced the gum (Catal. of Osteology, Mus. Roy. Coll. of Surgeons, vol. ii. p. 577, 4to, 1853).

† Quarterly Journal of the Geological Society, December 1847.

‡ Since the communication of my paper on the classification and affinities of the hoofed animals to the Geological Society, Nov. 3, 1847, in which the grounds for the division of the *Ungulata* into two orders, according to the parity or imparity of the digits, as proposed in my 'Odontography,' are given in detail, the idea has been ventilated and more or less adopted by M. Pomel (Comptes Rendus de l'Acad. des Sciences, June 19, 1848), and by M. Gervais (Zoologie et Paléontologie Française, p. 42). The latter experienced palæontologist, extending the term 'Pachydermes' to include all the Ungulates, divides

The third division of the *Gyrencephala* enjoy a higher degree of the sense of touch through the greater number and mobility of the digits, and the smaller extent to which they are covered by horny matter. This substance forms a single plate, in the shape of a claw or nail, which is applied to only one of the surfaces of the extremity of the digit, leaving the other, usually the lower, surface possessed of its tactile faculty; whence the name *Unguiculata*, applied to this group, which, however, is more restricted and natural than the group to which Linnæus extended the term. All the species are 'diphyodont,' and the teeth have a simple investment of enamel.

The first order, CARNIVORA, includes the beasts of prey, properly so called. With the exception of a few Seals, the incisors are $\frac{3-3}{3-3}$ in number; the canines $\frac{1-1}{1-1}$, always longer than the other teeth, and usually exhibiting a full and perfect development as lethal weapons; the molars graduate from a trenchant to a tuberculate form, in proportion as the diet deviates from one strictly of flesh to one of a more miscellaneous kind. The clavicle is rudimental or absent; the innermost digit is often rudimental or absent; they have no vesiculæ seminales; the teats are abdominal; the placenta is zonular. The Carnivora are divided, according to modifications of the limbs, into 'pinnigrades,' 'plantigrades,' and 'digitigrades.' In the Pinnigrades (Walrus, Seal-tribe) both fore and hind feet are short, and expanded into broad, webbed paddles for swimming, the hinder ones being fettered by continuation of integument to the tail. In the Plantigrades (Bear-tribe) the whole or nearly the whole of the hind foot forms a sole, and rests on the ground. In the Digitigrades (Cat-tribe, Dog-tribe, &c.) only the toes touch the ground, the heel being much raised.

It has been usual to place the Plantigrades at the head of the Carnivora, apparently because the higher order, Quadrumana, is plantigrade; but the affinities of the Bear, as evidenced by internal structure, *e. g.* the renal and genital organs, are closer to the Seal-tribe*; the broader and flatter pentadactyle foot of the planti-

them into 'Pachydermes herbivores' and 'Pachydermes omnivores,' respectively equivalent to my *Perissodactyla* and *Artiodactyla*, which latter terms M. Pomel adopts. M. Gervais writes: "Les pachydermes omnivores se lient d'une manière si intime aux Ruminants par les Chevrotains et les Chameaux, qu'il est devenu impossible de séparer, comme ordre différent de celui des Ruminants l'ensemble de ces Pachydermes, autrefois confondus avec les Pachydermes herbivores."—*Op. cit.* Expl. de Planche xxxvi. p. 6, 4to, 1854.

* 'Catalogue of the Physiological Series,' Mus. R. Coll. of Surgeons, 4to, vol. ii. 1834, p. 127. Mr. Waterhouse, in noticing the projecting process on the

grade is nearer in form to the flipper of the Seal than is the more perfect digitigrade, retractile-clawed, long and narrow hind foot of the feline quadruped, which is the highest and most typical of the Carnivora.

The next perfection which is superinduced upon the unguiculate limb is such a modification in the size, shape, position, and direction of the innermost digit, that it can be opposed, as a thumb, to the other digits, thus constituting what is properly termed a 'hand.' Those Unguiculates which have both fore and hind limbs so modified, or at least the hind limbs, form the order QUADRUMANA. They have $\frac{2-2}{2-2}$ incisors*, and $\frac{3-3}{3-3}$ broad tuberculate molars†; perfect clavicles, pectoral mammae, vesicular and prostatic glands, a simple or slightly bifid uterus, and a discoid, sometimes double, placenta‡. The Quadrumana have a well-marked threefold geographical as well as structural division. The Strepsirhines are those with curved or twisted terminal nostrils, with much modified incisors, commonly $\frac{3-3}{3-3}$; premolars $\frac{3-3}{3-3}$ or $\frac{2-2}{2-2}$ in number, and molars with sharp tubercles; the second digit of the hind limb has a claw. This group includes the Galagos, Pottos, Aye-Ayes, Loris, Indris, and the true Lemurs; the three latter being restricted to Madagascar, whence the group diverges in one direction to the continent of Africa, in the other to the Indian Archipelago. The Platyrrhines are those with the nostrils subterminal and wide apart; premolars $\frac{3-3}{3-3}$ in number, the molars with blunt tubercles; the thumbs of the fore-hands not opposable or wanting; the tail in most prehensile; they are peculiar to South America. The Catarrhines have the nostrils oblique and approximated below, and opening above and behind the muzzle: the premolars are $\frac{2-2}{2-2}$ in number; the thumb of the fore-hand is opposable. They are restricted to the Old World, and, save a single species on the rock of Gibraltar, to Africa and Asia. The highest organized family of Catarrhines is tailless, and offers in the Orang and Chimpanzee the nearest approach to the human type.

under side of the ramus, a little in advance of the angle of the lower jaw in the *Ursidae*, remarks:—"The same character is also found in many Seals (*Phocidae*), which in several other respects appear to approach the bears."—Proc. Zool. Soc. Sept. 1839.

* With few exceptions in the anomalous *Lemuridae*.

† Reduced to $\frac{2-2}{2-2}$ in the Marmosets (*Hapale*, *Mydas*).

‡ Among the Platyrrhines, the placenta is single in *Myctes*, double in *Callithrix*; among the Catarrhines, the placenta is double in *Macacus*, *Cercopithecus*, and *Semnopithecus*, single in *Troglodytes*.

The structural modifications in the genus *Homo*,—the sole representative of the *Archencephala*,—more especially of the lower limb, by which the erect stature and bipedal gait are maintained, are such as to claim for MAN ordinal distinction on merely external zoological characters. But as I have already argued, his psychological powers, in association with his extraordinarily developed brain, entitle the group which he represents to equivalent rank with the other primary divisions of the class *Mammalia* founded on cerebral characters. In this primary group Man forms but one genus, *Homo*, and that genus but one order, called BIMANA, on account of the opposable thumb being restricted to the upper pair of limbs. The testes are scrotal; their serous sac does not communicate with the abdomen; they are associated with vesicular and prostatic glands. The penis is pendulous, and the prepuce has a frænum. The mammæ are pectoral. The placenta is a single, subcircular, cellulo-vascular, discoid body.

Man has only a partial covering of hair, which is not merely protective of the head, but is ornamental and distinctive of sex. The dentition of the genus *Homo* is reduced to thirty-two teeth by the suppression of the outer incisor and the first two premolars of the typical series on each side of both jaws, the dental formula being:—

$$i. \frac{2-2}{2-2}, \quad c. \frac{1-1}{1-1}, \quad p. \frac{2-2}{2-2}, \quad m. \frac{3-3}{3-3} = 32.$$

All the teeth are of equal length, and there is no break in the series; they are subservient in Man not only to alimentation, but to beauty and to speech.

The human foot is broad, plantigrade, with the sole, not inverted as in *Quadrumania*, but applied flat to the ground; the leg bears vertically on the foot; the heel is expanded beneath; the toes are short, but with the innermost longer and much larger than the rest, forming a 'hallux' or great toe, which is placed on the same line with, and cannot be opposed to, the other toes; the pelvis is short, broad, and wide, keeping well apart the thighs; and the neck of the femur is long, and forms an open angle with the shaft, increasing the basis of support for the trunk. The whole vertebral column, with its slight alternate curves, and the well-poised, short, but capacious subglobular skull, are in like harmony with the requirements of the erect position. The widely-separated shoulders, with broad scapulæ and complete clavicles, give a favourable position to the upper limbs, now liberated from the service of locomotion, with complex joints for rotatory as well as

flexile movements, and terminated by a hand of matchless perfection of structure, the fit instrument for executing the behests of a rational intelligence and a free will. Hereby, though naked, Man can clothe himself, and rival all native vestments in warmth and beauty; though defenceless, Man can arm himself with every variety of weapon, and become the most terribly destructive of animals. Thus he fulfils his destiny as the supreme master of this earth, and of the lower Creation.

In these endeavours to comprehend how Nature has associated together her mammalian forms, the weary student quits his task with a conviction that, after all, he has been rewarded with but an imperfect view of such natural association. The mammalian class has existed, probably from the triassic, certainly from the lower oolitic period; and has changed its generic and specific forms more than once in the long lapse of ages, during which life-work has been transacted on this planet by animals of that high grade of organization. Not any of the mammalian genera of the secondary periods occur in the tertiary ones. No genus found in the older eocenes (plastic and septarial clays, &c.) has been discovered in the newer eocenes. Extremely few eocene genera occur in miocene strata, and none in the pliocene. Many miocene genera of Mammalia are peculiar to that division of the tertiary series. Species indistinguishable from existing ones begin to appear only in the newer pliocene beds. Whilst some groups, as *e. g.* the Perissodactyles and omnivorous Artiodactyles, have been gradually dying out, other groups, as *e. g.* the true Ruminants, have been augmenting in genera and species.

In many existing genera of different orders there is a more specialized structure, a greater deviation from the general type, than in the answering genera of the miocene and eocene periods; such later and less typical Mammalia do more effective work by their more adaptively modified structures. The Ruminants, *e. g.* more effectually digest and assimilate grass, and form out of it a more nutritive and sapid kind of meat, than did the antecedent more typical or less specialized non-ruminant Herbivora.

The monodactyle Horse is a better and swifter beast of draught and burthen than its tridactyle predecessor the miocene *Hipparion* could have been. The nearer to a Tapir or a Rhinoceros in structure, the further will an equine animal be left from the goal in contending with a modern Racer. The genera *Felis* and *Machairodus*, with their curtailed and otherwise modified dentition and

short strong jaws, become, thereby, more powerfully and effectively destructive than the eocene *Hyænodon* with its typical dentition and three carnassial teeth on each side of its concomitantly prolonged jaws could have been.

Much additional and much truer insight has, doubtless, been gained into the natural grouping of the Mammalia since palæontology has expanded our survey of the class; but our best-characterized groups do but reflect certain mental conceptions, which must necessarily relate to incomplete knowledge, and that as acquired at a given period of time. Thus the order which Cuvier deemed the most natural one in the class *Mammalia* becomes the debris of a group, known at a subsequent period to be a more natural order.

We cannot avoid recognizing, in the scheme which I now submit, the inequality which reigns amongst the groups, which our present anatomical knowledge leads us to place in one line or parallel series as orders. I do not mean mere inequality as respects the number and variety of the families, genera, and species of such orders, because the paucity or multitude of instances manifesting a given modification or grade of structure in no essential degree affects the value of such grade or modification.

The order *Monotremata* is not the less ordinally distinct from the *Marsupialia*, because it consists of but two genera, than is the order *Bimana* from that of *Quadrumanæ*, because it includes only a single genus. So likewise the anatomical peculiarities of the *Proboscidea*, *Sirenia*, and *Toxodontia* call, at least, for those general terms, to admit of the convenient expression of general propositions respecting them; and some of these general propositions are of a value as great as the organic characters of more expanded orders.

There are residuary or aberrant forms in some of the orders, which, to the systematist disagreeably, compel modifications of the characters that would apply to the majority of such orders. The flying Lemurs (*Galopithecæ*), the rodent Lemurs (*Cheiromys*), the slow Lemurs (*Loris*, *Otoliennæ*), forbid any generalization as to teeth or nails in the *Quadrumanæ*, whilst they continue associated with that order by the character of the hinder thumb; which, by the way, they possess in common with the pedimanous Marsupials. The large, volant, frugivorous Bats (*Pteropus*) are equally opposed to the application of a common dental character to the *Cheiroptera*. They are associated with the insectivorous Bats on account of the common external form arising out of the modification of their locomotive

organs for flight, just as the Dugongs and Manatees are associated with the *Cetacea* on account of their resemblance to Fishes arising out of the same modification of the locomotive system for an aquatic existence. The herbivorous *Cetacea* are now separated from the piscivorous *Cetacea* as a distinct order; and with almost as good reason we might separate the frugivorous from the insectivorous *Cheiroptera*; the cases are very nearly parallel.

Nature, in short, is not so rigid a systematist as Man. There are peculiar conditions of existence which she is pleased shall be enjoyed by peculiarly modified mammals; these peculiarities break through the rules of structure which govern the majority of species existing and subsisting under the more general conditions of existence, to which the larger groups of Mammalia are respectively adjusted.

One class of organs seems to govern one order, another class another order; the dental system, which is so diversified in the *Marsupialia* and *Bruta*, is as remarkable for its degree of constancy in the *Rodentia* and *Insectivora*. But, as a general rule, the characters from the dental, locomotive, and placental systems are more closely correlated in the Gyrencephalous orders than in those in the inferior subclasses of the Mammalia.

In the subjoined tabular view of the classification of the Mammalia, the groups below the ranks of orders are inserted merely as illustrations of those orders, not as equivalent subdivisions, or as the most natural subdivisions of those orders, into which it has not been the aim of the present paper to enter.

TABLE of the Subclasses and Orders of the *Mammalia*.

CLASS.

SUBCLASS.

ORDER.

Archencephala*	BIANA			Homo.	
	QUADRU MANA			Carnithia.	
Gyrencephala†	Unguiculata	CARNIVORA			Platyrrhina.
		PRIMATI GRADA.			Strepsirrhina.
	AKTIODACTYLA	PRIMATI GRADA.			Diplograda.
		PRIMATI GRADA.			Primategrada.
	PERISSODACTYLA ..	OMIVORA.			Ruminantia.
		SOLITUNGULA.			Artiodactyla.
	PRODOSCIDA	Elephas.			Manatius.
		DINOTHE RIUM.			Edentula.
	TOXODONTIA	Tosodon.			Brachypodida.
		Nesodon.			Dasyproctida.
Lysencephala†	Mutilata	SIRENIA			Edentula.
		CETACEA			Erngirota.
	BRUTA	INSECTIVORA			Insectivora.
		Talpida.			Erngirota.
	CHEIROPTERA	Soricida.			Non-claviculata.
		Non-claviculata.			Claviculata.
	INSECTIVORA	Rhizophaga.			Porphyga.
		Carporphaga.			Eutoniophaga.
	RODENTIA	Echidna.			Ornithorhynchus.
		Lysencephala.			
Lyencephala§	MONOTREMATA	Lysencephala.			
		Lysencephala.			

* ἀρχω, to over-rule, ἐγκέφαλος, the brain. † γυρόω, to wind about, ἐγκέφαλος. ‡ λείω, to loose, ἐγκέφαλος.

Description of a new form of Naked-Eyed Medusa (*Thaumantias achroa*), with brief histological details. By T. SPENCER COBBOLD, Esq., M.D. Communicated by the Secretary.

[Read March 17, 1857.]

(Abstract.)

THIS specimen was obtained from the shore of the Firth of Forth, and presented the following characters:—The form and general aspect of the *umbrella* resembles that of the more typical species, being hemispherical, transparent, colourless, smooth, slightly elongated vertically when in a state of rest, the transverse diameter measuring rather more than the third of an inch and becoming much increased during contraction, the length of the disk at the same time being proportionately lessened. The circumferential portion of the umbrella is fringed by 24 tentacula of extreme delicacy and unusual length; also by eight ocelli, a circular gastro-vascular canal, and a well-defined shelf-like veil directed inwards. The *tentacula*, while relaxed and motionless, are fully three times the length of the disk, their particular number and arrangement ($5 \times 4 + 4$) also constituting a satisfactory mark of identification. Amplified fifty diameters, they exhibit a finely granular and ringed appearance, analogous to that of the prehensile labiate organs of *Hydroida*; even with an ordinary pocket-lens indications of knotting may be seen at the extremities of the cirrhi. To the naked eye the tentacular bulbs appear colourless and homogeneous, but under a magnification of 300 diameters linear, the sub-epidermic tissues display numerous closely packed oval or fusiform cells, which refract light very strongly. Near the extremity of the thread, the cells are more cogently developed, and being placed at a right angle to the axis of the filament, appear to stand out from the investing epidermis. At the upper part the tentacula exhibit lateral lines in their interior, denoting the presence of a central canal, the markings becoming more conspicuous near the bulb. Within the bulb the limiting membrane of an otolithic vesicle was discernible, but there were apparently no vibratory movements within the cavity. The *ocelli*, eight in number (2×4), are placed round the circular margin of the disk, at intervals between every third tentacle—an arrangement somewhat peculiar. Each ocellus consists of a transparent vesicle containing a round nucleus, and in addition five bright yellow, highly refracting globules, the central and superior one being the largest. The *sub-umbrella* is placed

rather higher than midway between the marginal ring and the convex surface of the disk. The depth of the concavity lessened during contraction, but not uniformly so, it being observed that the upper part remained unaffected to the extent of a third of its area, from the summit downwards, forming, as it were, a *point d'appui* for the development of contractile action throughout the remainder of the membrane. The probosciform *peduncle* has all the features common to the genus. The *gastro-vascular* canals—four radiating and one circumferential—contain two kinds of corpuscles; the smaller are rather less in diameter than human-blood globules, while the larger, apparently mother-cells, are nearly three times greater, possessing nuclei of variable size, but frequently identical in character with the lesser corpuscles. They moved in a moderately rapid and regular manner, their course in the radiating vessels being continuous from one half of the hemisphere to the other. Thus, two vessels carried the particles from the marginal canal, convergingly, to the central point of intercommunication, on the one hand, and two conveyed the same elements from the centre, divergingly, on the other. The *reproductive glands*, four in number, elongated or semiclavate, are placed on the inferior surface of the sub-umbrella, a short way distant from the margin, and in the course of the radiating canals. Each gland was subdivided by one of the radiating vessels traversing its long axis. The subjacent ova at the surface generally displayed an outer cell-wall, with its included transparent albumen, a second membrane surrounding the molecular yolk, and a third constituting the germinal spot, within which were three or four rounded particles, beautifully distinct. Deeper in the organ were similar cells, smaller in size and imperfectly developed, evidently destined to supply the place of those ripe for expulsion.

To facilitate identification, it may be remarked that *Thaumantias inconspicua* has the disk wider and more flattened, purplish-coloured glands and twenty tentacles. *T. punctata* has thirty-two tentacula, and is a larger species, with the umbrella more depressed, and *T. Thomsoni* has but sixteen tentacula. There is no other British species for which *Thaumantias achroa* can be readily mistaken.

On the Irregularity in the Return of Swallows and other vernal migratory Birds, this Season, 1857. By Dr. THOMAS FORSTER, F.L.S. &c.

[Read June 2, 1857.]

As the following facts will probably be interesting to the Linnean Society, I have carefully extracted them from my Journal of Natural History.

The order of arrival of the Swallow tribe has been quite reversed. The Chimney Swallow, *Hirundo rustica*, who usually arrives in Belgium about the 15th of April, made his first appearance early in May, and then only a straggler or two. This species is not yet common, and after a most careful search after Swallows, up to May the 11th, I had not *myself* seen a single specimen: one or two are said to have been observed about the waters of Ixelles.

A straggling Martin, *H. urbica*, was observed by me on the 23rd of April; but I did not see another till the 9th of May, and this species is still very scarce. Today (14th of May) a *few* Swallows may also be seen. In general, both species are by this time very numerous.

The Swift, *H. apus*, who usually arrives in Belgium before the 1st of May, did not appear till the 9th; and yesterday these birds are become common, though much less numerous than last year.

The Sand Martin, *H. riparia*, has not yet arrived.

The Cuckoo has been heard only once or twice, and that in the first week of May.

I find by consulting ancient records that the occasional delay of the arrival of the Swallow was noticed in Greece of old, and it is probably to some occasion of this kind that we may attribute the line in some poet, I believe Aristophanes,

Ἦ Ζεῦ, χελιδὼν ἄρα πότε φαινέσεται;!!!

The absence of west winds on the continent has been no less remarkable, as this wind has always been connected with the return of the Swallow—

“Cum Zephyris, si concedes, et hirundine primâ.”

So says Horace; and the Martin has also been said to come with S.W. breezes. Ovid represents this wind as blowing

“Quum luteum celsâ sub trabe fingit opus.”

The scarcity of all the vernal songsters has likewise been remarked: the season is altogether late and anomalous.

Bruzelles, May 14th, 1857.

Note on a singular case of Colouring of the Human Hair. By
WILLIAM A. GUY, M.B. Extracted from a Letter addressed
to the President.

[Read April 7th, 1857.]

A turner of the name of Ford, employed by the Government to turn several thousands of round rulers for the army in the Crimea, presented himself in the laboratory of King's College one day, in great distress. He was called upon to attend a funeral, and was scandalized at his somewhat ridiculous appearance in consequence of the curious green tint of his hair. Our people in the laboratory washed his head with all the common reagents which occurred to them, but without effect. Being informed of this curious fact, and being interested in it as having some sort of bearing on the question of identification, I called on Mr. Ford, and found him in the state described. His hair, which is naturally a light chestnut, was changed, except towards the roots, of a bright yellow-green, with a very decided and curious green tint. His children, whose hair is of a similar tint, were similarly affected. He told me that his hair and that of his family had always been affected in the same way when engaged in turning rulers from the wood known as *green ebony*—a wood, as he says, generally used for that purpose. His wife's hair, which is black, is not subject to any change. The exposed parts of the skin undergo the same change of colour, as does the urine. He also told me that one of his children was born with a very remarkably deep-green tinted skin, which disappeared in time. As one of our porters passes Broad Street, I send you a specimen I have had put up, showing a bit of the wood, a tube-full of turnings, and three specimens of hair—the two on the left showing the natural colour of the hair of Mr. Ford and one of his children, the specimens on the right the same hair discoloured by the wood, and a single specimen from his own head, showing the usual colour at the root, and the green tint towards the points. The appearance of the whole head, and the contrast of the roots with the rest of the hair, are much more striking than the specimen itself might lead you to expect.

King's College, London,
January 27th, 1857.

Catalogue of the Hymenopterous Insects collected at Sarawak, Borneo; Mount Ophir, Malacca; and at Singapore, by A. R. WALLACE. By FREDERICK SMITH, Assistant in the Zoological Department in the British Museum. Communicated by W. W. SAUNDERS, Esq., F.R.S., F.L.S.

[Read June 16th, 1857.]

Fam. ANDRENIDÆ, *Leach*.

Gen. HALICTUS, *Latr.*

1. HALICTUS CERATINUS. *H. niger*; alis hyalinis; abdomine clavato. *Male*. Length $3\frac{1}{2}$ lines. Black: the head closely and finely punctured; antennæ as long as the thorax, the flagellum obscurely testaceous beneath; the face covered with griseous pubescence; the mandibles ferruginous at their apex. Thorax closely punctured; the wings hyaline and iridescent, their apex slightly clouded; the nervures and tegulæ testaceous; the legs rufo-testaceous, the tarsi paler, and covered with pale glittering pubescence. Abdomen clavate; the apical margins of the segments with fasciæ of short white pubescence, frequently more or less obliterated; shining and delicately punctured; beneath, the apex of the third segment, and the fourth, entirely clothed with very short whitish pubescence; the abdomen is of a dark rufo-testaceous hue, palest beneath, varying in different individuals.

Hab. Borneo (Sarawak).

This remarkable form of *Halictus* occurs at Sierra Leone. I have described a species from that locality, the "*H. clavatus*;" it is a smaller and very distinct species from *H. ceratinus*; in this species the first recurrent nervure is received in the middle of the second submarginal cell.

2. HALICTUS VAGANS. *H. ater*, cinereo-pubescent; abdomine nitido, segmentis intermediis basi fascia albis.

Female. Length $4\frac{1}{2}$ lines. Black: the clypeus produced, the face covered with cinereous pubescence. Thorax closely punctured above; the mesothorax thinly covered with short erect pale pubescence; the post-scutellum with a dense short downy pubescence; the metathorax truncate, and having some irregular coarse striæ at the base above; the wings hyaline and iridescent, the nervures and tegulæ testaceous; the legs with a short yellowish-white downy pubescence. Abdomen delicately punctured, the basal margin of the second and two following segments with a fascia of short yellowish-white pubescence, the apical segment covered with similar pubescence.

This species bears a very striking resemblance to the *Halictus leucozonius* of Europe.

Hab. Borneo (Sarawak).

3. *HALICTUS BASALIS*. *H. niger*; alis hyalinis; abdomine clavato, basi ferrugineo.

Male. Length 3 lines. Black: the antennæ nearly as long as the thorax, the flagellum fulvous beneath; the face covered with a dense griseous pubescence; the mandibles rufo-piceous. Thorax thinly clothed with pale pubescence; the wings hyaline and iridescent, the nervures pale testaceous; the tibiæ and tarsi pale rufo-testaceous, the latter palest. Abdomen clavate, shining and finely punctured; the first segment and the apical margin of the second, ferruginous; the second and following segments with fasciæ of pale pubescence.

Hab. Singapore.

This conspicuous insect might be mistaken at first sight for a variety of "*H. ceratinus*," but in that species the apical margin of the fifth segment of the abdomen, beneath, is straight, or very slightly emarginate at the sides: in the present species it is *deeply emarginate its entire width*.

GEN. *NOMIA*, Latr.

1. *NOMIA APICALIS*. *N. nigra*, punctata; abdomine nitido, scutello bituberculato; alis apice nigris.

Male. Length 5 lines. Black: the head with scattered cinereous pubescence, dense and short on the sides of the face; the clypeus with a longitudinal impression; somewhat swollen on each side; the flagellum testaceous beneath. Thorax closely punctured, subopaque; a line of pale pubescence beneath the scutellum, which is bituberculato; the tegulæ yellowish; the wings hyaline, the nervures testaceous, the costal nervure dark brown; the apex of the anterior wings with a large dark fuscous cloud; the legs with a glittering cinereous pubescence; the posterior tibiæ curved, and dilated at their apex. Abdomen shining and punctured, the apical margins of the segments depressed, the apical half of the depressions impunctate.

Hab. Singapore.

2. *NOMIA IRIDESCENS*, Westw. MS. *N. nigra*; capite thoraceque punctatis subopacis; faciei pube grisea; pedibus nigris; abdomine fasciis tribus cæruleis; alis hyalinis.

Female. Length 4 lines. Black: very closely and finely punctured; the head and thorax with a griseous pubescence, most dense on the face and sides of the metathorax; the clypeus with a central longitudinal carina; the mandibles obscurely ferruginous at the apex; a white line on the posterior margin of the prothorax, which passes on to and surrounds the tubercles; the scutellum bordered with a line of very short white pubescence; the tegulæ pale testaceous; the wings fulvo-hyaline, with the nervures pale ferruginous; the legs clothed with a mixture of dark brown and griseous pubescence, that on the posterior tibiæ within, and on all the tarsi beneath, fulvous; the claw-

joint of the tarsi ferruginous. Abdomen shining, with an obscure violet tinge in certain lights; the apical margins of the second, third and fourth segments with a fascia of bright green or blue-green; beneath, thickly and coarsely punctured.

Hab. Malacca, India.

3. *NOMIA ELEGANS*. *N. nigra*; capite thoraceque punctatis subopacis; alis hyalinis; pedibus subferrugineis; abdomine fasciis cæruleo-viridibus pulchriter ornatus.

Female. Length 5 lines. Black: the head closely and finely punctured, the clypeus coarsely so, with a central longitudinal depression, subtuberculate on each side; the labrum and mandibles ferruginous, the latter black at their tips; the scape in front, and the apical joints of the flagellum beneath, yellowish. Thorax: shining, with very delicate shallow punctures; a transverse band of pale pubescence at the apical margin of the scutellum; the base of the metathorax with a deep depression which is crossed by a series of short striæ; the sides of the metathorax with a dense pale fulvous pubescence; the legs pale rufo-testaceous, and covered with short glittering pale pubescence; wings subhyaline and iridescent; the nervures testaceous, the costal nervure and the stigma dark fuscous; the apex of the anterior wings slightly clouded. Abdomen smooth and shining, the apical margins of the segments with narrow, vivid blue-green fasciæ.

Hab. Malacca.

Most closely resembling the "*Nomia crassipes* ♀," but that insect has the abdomen punctured, and the fasciæ broad, particularly at the apex of the abdomen.

Subfam. ANDRENOIDES.

Gen. CTENOPLECTRA, *Smith*.

Head transverse: *antennæ* inserted in the middle of the face, short, not reaching to the middle of the thorax; the basal joint of the flagellum not narrowed at the base; the second joint of the same length as the first, much narrowed at the base; the three following joints transverse and of equal length, the five apical ones rather longer, of equal length, the apex of the apical joint pointed; the *labrum* transverse, the anterior margin rounded; the *mentum* rather longer than the labium, the former acute at its apex, the latter blunt or rounded; the *labial palpi* 4-jointed, the two basal joints stout and of equal length, the two apical ones shorter and much more slender; the *paraglossæ* about the same length as the palpi; the *maxillary palpi* 6-jointed, the three basal joints stout and of equal length, the three apical joints much more slender, and each in succession shorter than the preceding; the *ocelli* placed in a curve on the vertex. *Thorax*: large and ovate; the *anterior wings* with one marginal and two sub-

marginal cells, the second receiving both the recurrent nervures; *legs* with the femora broad and compressed; the calcaria at the apex of the intermediate tibiæ stout, acute, and bent at the apex, its hinder margin toothed like a fine comb; the inner spine of the posterior calcaria toothed in a similar manner, the teeth much longer, those at the base of the spine longest, decreasing in length to the apex; the posterior tibiæ and basal joint of the tarsi densely covered with long hair; the claws of the tarsi bifid. *Abdomen* subovate, truncated at the base.

This is a very remarkable genus of Bees: it appears to be most nearly allied to the genus *Macropis*; the venuration of the anterior wings is very similar, and the labial and maxillary palpi consist of the same number of joints; the ocelli are placed in a curve, and the posterior legs have a dense clothing or pollen-brush as in that genus.

The beautiful comb with which the posterior tibiæ are furnished is doubtless for the purpose of removing the grains of pollen collected on the hairs which clothe the shanks. (Plate I. details.)

1. CTENOPECTRA CHALYBEA. *C.* capite thoraceque nigris, abdomineque chalybeo, pedibus posterioribus dense pilosis.

Female. Length 6 lines. Head and thorax black: the head closely punctured; the clypeus shining, the punctures more scattered, and with a slight carina in the middle of its base; the scape in front, and the flagellum beneath, rufo-piceous; the mandibles ferruginous at their apex. Thorax opaque-black: the metathorax smooth and shining in the middle of its base, the sides covered with sooty-black pubescence; wings fuscous, palest at their apical margins; the posterior tibiæ and basal joint of the tarsi densely covered with long black pubescence, the inner pectinated calcar pale testaceous-yellow. Abdomen: steel-blue above, black beneath.

Hab. Malacca (Mount Oplir).

Subfam. DASYGASTRÆ.

Gen. MEGACHILE, *Latr.*

1. *Megachile atrata*, *Smith, Cat. Hym.* pt. 1. p. 182.

Hab. Borneo (Sarawak); Philippine Islands.

2. *Megachile ornata*, *Smith, Cat. Hym.* 1. p. 183.

Hab. Borneo (Sarawak); India.

3. *Megachile umbripennis*, *Smith, Cat. Hym.* pt. 1. p. 175.

Hab. Borneo (Sarawak) and Nepal.

4. MEGACHILE AMPUTATA. *M.* nigra; capite thoraceque pube fulva vestitis; abdominis segmentis apicalibus fulvo marginatis; pedibus rufis.

Female. Length 7 lines. Black: the head and thorax clothed above with fulvous pubescence, on the cheeks and thorax beneath it is

slightly griseous; the clypeus shining and punctured, with a longitudinal carina in the middle, thinly covered with pubescence; the flagellum fulvous beneath. Thorax: the tegulae and legs ferruginous; the wings fusco-hyaline, the nervures fusco-ferruginous, brightest towards the base of the wings. Abdomen: the two basal segments clothed with fulvous pubescence, the four apical segments with black; all the segments with a fascia of short fulvous pubescence on their apical margins; beneath, the three basal segments thinly clothed with pale fulvous pubescence, the three apical ones with black.

Allied to, but very distinct from, the *Anthophora rufipes* of Fabricius.

Hab. Borneo (Sarawak).

5. *MEGACHILE TUBERULATA*. *M. nigra*; capite thoraceque punctatis, mandibulis fortibus et porrectis; clypeo tuberculato; alis fulvo-hyalinis; abdomine totius nigro.

Female. Length 10 lines. Black: clothed with black pubescence on the vertex and disk of the thorax, on the abdomen above it is sparing; the clypeus produced in the middle, forming a large prominent tubercle; the mandibles long, very stout and prominent, with a stout bluntish tooth on their inner margin near their base, and having three large teeth at their apex, the apical one acute. The outer margin of the tegulae ferruginous; the wings fulvo-hyaline, the nervures ferruginous, their apical margins with a fuscous border. Abdomen: the basal segment densely clothed with sooty-black pubescence; beneath, densely clothed with black pubescence.

Hab. Borneo (Sarawak).

6. *MEGACHILE ARCHITECTA*. *M. nigra*, nitida et punctata; abdomine pube laete fulva subtus vestito; alis subhyalinis apice nebulosis.

Female. Length 6 lines. Black, shining and punctured: the face, cheeks and thorax beneath, thinly clothed with griseous pubescence, the sides of the metathorax densely so; the wings subhyaline, with a fuscous cloud at the apex of the superior pair; the posterior femora and tibiae with a short fine cinereous pubescence, that on all the tarsi beneath, fulvous. Abdomen subovate and curving upwards, each segment with a deeply impressed transverse line; beneath, densely clothed with long bright fulvous pubescence.

Hab. Borneo (Sarawak).

7. *MEGACHILE LUCTUOSA*. *M. nigra* opaca; alis hyalinis; abdomine subtus fulvo; apice pube grisea vestito.

Female. Length 6 lines. Opaque-black: very closely punctured; the wings hyaline and iridescent, the nervures black; the base of the metathorax with fuscous pubescence, the sides as well as the thorax beneath with griseous; the apical margins of the second, third and fourth segments with narrow fasciae of whitish pubescence, the two former widely interrupted; the fifth and sixth densely covered

with short, whitish pubescence; beneath, clothed with fulvous pubescence.

Hab. Singapore.

8. *MEGACHILE ROTUNDICEPS*. *M. nigra opaca*; alis fulvo-hyalinis, nervuris ferrugineis; abdomine subtus fulgido-argentato vestito.

Female. Length 6 lines. Opaque-black: very closely and rather finely punctured; the labrum fringed with ferruginous pubescence; the head nearly orbicular. Thorax: the metathorax clothed with pale fulvous pubescence; the wings fulvo-hyaline, the nervures and tegulæ pale ferruginous. Abdomen with a little fulvous pubescence at the base; beneath, clothed with glittering silvery pubescence.

Hab. Malacca (Mount Ophir).

Subfam. SCOPULIPEDES.

Gen. CERATINA, *Latr.*

1. *Ceratina hieroglyphica*, *Smith, Cat. Hym.* pt. 2. p. 226.

Hab. Borneo (Sarawak).

2. *CERATINA FLAVOPICTA*. *C. atra*; capite thoraceque flavo-pictis; abdomine fasciisque flavis.

Male. Length 4 lines. Black: the face, inner orbits of the eyes, clypeus, labrum, mandibles, cheeks, scape, and a minute spot above the eyes, yellow. Thorax: the prothorax, two longitudinal lines on the disk of the mesothorax, an epaulet over the tegulæ, a line on each side of the metathorax, a spot beneath the wings, the tubercles and legs, yellow; the coxæ and base of the femora slightly rufo-piceous; the wings subhyaline, the nervures ferruginous. Abdomen: the basal and apical segments, and the apical margins of the other segments, yellow; the entire insect is shining and the abdomen delicately punctured.

Hab. Borneo (Sarawak).

This species is closely allied to the *Ceratina hieroglyphica* from India, but is abundantly distinct.

Gen. XYLOCOPA, *Latr.*

1. *Xylocopa latipes*.

Apis latipes, *Drury, Ill. Exot. Ins.* ii. p. 98.

Hab. Borneo (Sarawak), India, Singapore, Ceylon, Philippine Islands, China.

2. *Xylocopa collaris*, *St. Farg. Hym.* ii. p. 189.

Hab. Borneo (Sarawak), India, Sumatra, Bengal, Malacca.

3. *XYLOCOPA ÆSTUANS*.

Apis æstuous, *Linn. Syst. Nat.* i. p. 961 ♀.

Hab. Singapore, India.

4. *Xylocopa verticalis*, *St. Farg. Hym.* ii. p. 195 ♂.

This species I believe to be the male of *X. æstuans*.

Hab. Singapore, India.

5. *Xylocopa cærulea*, *Fabr. Syst. Piez.* p. 345.

Hab. Singapore, Java, East India, China.

6. *Xylocopa Dejeanii*, *St. Farg. Hym.* ii. p. 209.

Hab. Borneo, Java.

This I have little doubt is the male of *X. collaris*: I have on several occasions observed that they have been captured at the same time and place.

7. *Xylocopa dissimilis*, *St. Farg. Hym.* ii. p. 180 ♀.

Hab. Borneo (Sarawak), China, Madras.

8. *XYLOCOPA INSULARIS*. *X. nigra*; capite thoraceque pube rufo-fusca tectis; alis nigro-fuscis iridescentibus, apice acuminatis; oculis magnis, vertice fere connexis.

Male. Length 11 lines. Black: the head and thorax densely clothed with short rufo-fulvous pubescence; the eyes very large and approximating at the vertex; the anterior legs fringed with long black pubescence behind; the intermediate and posterior legs with black pubescence, very long on the posterior tarsi; the disk of the thorax very smooth and shining; the anterior wings pointed at their apex; the wings brown, with a violet and coppery iridescence; the posterior margins palest; the transverse nervure which separates the first and second submarginal cells, obliterated. Abdomen punctured; the basal and lateral margins with a thick fringe of black pubescence, the apical margins of the segments depressed and slightly rufo-piceous.

Hab. Borneo (Sarawak).

Gen. ANTHOPHORA, *Latr.*

1. *Anthophora zonata*.

Apis zonata, *Linn. Syst. Nat.* i. p. 955.

Hab. Borneo (Sarawak).

2. *ANTHOPHORA INSULARIS*. *A. nigra*, pube fulva vestita, faciei pube grisea.

Female. Length 7 lines. Black: the face, cheeks and thorax beneath clothed with griseous pubescence, that on the thorax above and on the abdomen is fulvous; the fifth segment of the abdomen with a mixture of black hairs; the legs have a fulvous pubescence outside; within it is black, it is also black at the apex of the plantæ of the posterior legs. The mandibles, labrum, anterior margin of the clypeus and a narrow central longitudinal line, a minute spot above the clypeus,

and the flagellum beneath, yellow; the tegulae yellow, the wings fulvo-hyaline.

Hab. Borneo (Sarawak).

This species closely resembles both the *A. vestita* and the *A. concinna*, but is on comparison very distinct.

Subfam. SOCIALES.

Gen. APIS, Linn.

1. *Apis dorsata*, *Fabr. Syst. Piez.* p. 370.

Hab. India, Borneo (Sarawak), Malacca.

2. *Apis Indica*, *Fabr. Syst. Piez.* p. 370.

Hab. India, Malacca, Borneo.

3. *Apis Perrottetii*, *Guér. Icon. Règ. Anim. Ins.* p. 461.

Hab. Borneo (Sarawak). India.

The specimens from Sarawak are of a paler colour than those described by Guérin, but they agree in all the essential specific characteristics, and have the bands of pale pubescence at the base of the segments, as in *A. Perrottetii*; these bands, if the abdomen retracts after death, are hidden beneath the apical margins of the preceding segments.

4. *APIS ANDRENIFORMIS.* *A. nigra* laevis nitida; alis hyalinis; abdomine fasciis albis pubescentibus ornato.

Worker. Length 4 lines. Black: smooth and shining, slightly pilose; the face with a short cinereous pubescence; the metathorax, the coxae and femora beneath with whitish pubescence; the wings hyaline and iridescent; the basal margin of the second segment of the abdomen slightly rufo-piceous; the basal margins of the third, fourth, fifth and sixth segments with bands of white pubescence; beneath, the three basal segments of the abdomen pale testaceous in the middle.

Hab. Borneo (Sarawak).

This remarkable Honey-Bee has exactly the appearance of an *Andrena*; it does not appear to be a worn specimen; the wings are not torn, and the abdominal bands entire; the eyes are pubescent, but less conspicuously so than in any species I have previously seen.

5. *APIS TESTACEA.* *A. capite* thoraceque nigris, abdomine pedibusque pallide testaceis, alis hyalinis.

Worker. Length 8 lines. Head dark fuscous; the ocelli shining, yellow; the extreme base of the scape and the tips of the mandibles, as well as the tongue, of a reddish-yellow; the head covered with rufo-fuscous pubescence, that on the cheeks palest. Thorax fuscous anteriorly, the metathorax, tegulae and legs pale rufo-testaceous; the thorax and legs with a pale yellowish-white pubescence, intermixed

with a few fuscous hairs on the disk of the mesothorax; the wings hyaline, with the nervures pale testaceous. Abdomen: pale testaceous and densely clothed with short yellowish-white pubescence.

Hab. Borneo.

A very distinct species from any hitherto described: its densely pubescent body is a distinguishing characteristic.

Genus TRIGONA, *Jurine*.

1. TRIGONA VENTRALIS. *T. nigra*; abdomine nigro-piceo; segmento basali supra, abdomine subtus albis.

Worker. Length $1\frac{2}{3}$ line. Head and thorax black; the extreme base of the scape, and the flagellum rufo-fuscous; the tips of the mandibles ferruginous; the clypeus and lower part of the face with a cinereous pile. Thorax: narrower than the head; the mesothorax margined with short whitish pubescence, the outer margin of the tegulæ rufo-piceous; the wings hyaline and iridescent, the nervures dark ferruginous; the apical joints of the tarsi pale; the posterior tibiæ broadly expanded towards their apex, their upper margin thinly fringed with pale hairs, the basal joint of the tarsi clothed with golden pubescence within. Abdomen dark rufo-piceous; the basal segment white, beneath entirely so.

Hab. Borneo (Sarawak). Malacca (Mount Ophir).

2. TRIGONA ATRIPES. *T. flavescens-rufa*; alis dimidio basali fuscis, apicali lacteis, tibiis tarsisque intermediis et posticis nigris.

Worker. Length $2\frac{1}{2}$ lines. Pale reddish-yellow; the flagellum fuscous above; wings reddish-brown, with their apex beyond the stigma milky-white; the intermediate and posterior tibiæ and tarsi black, the apical joints of their tarsi ferruginous; the anterior legs entirely reddish-yellow; the scutellum fringed with fuscous hairs.

Hab. Malacca (Mount Ophir).

3. TRIGONA THORACICA. *T. nigra*; thorace obscure ferrugineo, alis flavo-hyalinis, abdomine basi pallide testaceo.

Worker. Length $3\frac{1}{2}$ lines. Black: the scape of the antennæ at the base, the clypeus and mandibles at their base, ferruginous. Thorax: obscurely ferruginous, the legs more or less ferruginous towards their base; the wings flavo-hyaline. Abdomen smooth and shining, pale testaceous at the base.

Hab. Singapore.

4. TRIGONA NITIDIVENTRIS. *T. nigra*; alis subhyalinis, coxis et unguibus pallide ferrugineis; abdomine supra nitido, nigro, subtus pallide testaceo.

Worker. Length $3\frac{1}{2}$ lines. Black: the extreme base of the scape ferruginous; the wings subhyaline and iridescent, slightly fuscous towards their base, the nervures testaceous; the margins of the thorax

and the scutellum with ochraceous pubescence; the coxæ and claw-joint of the tarsi rufo-testaceous. Abdomen shining black, its extreme base, and beneath entirely, pale testaceous.

Hab. Malacca (Mount Ophir).

5. *TRIGONA LÆVICEPS*. *T. nigra*; capite lævi et nitido, antice pube cinerea tecto; thorace nitido, alis subhyalinis, abdomine castaneo-rufo.

Worker. Length $1\frac{1}{2}$ line. Head and thorax black: the face, above the insertion of the antennæ, smooth and shining; the antennæ rufo-testaceous; the clypeus with a hoary pubescence; its anterior margin, and also the mandibles, ferruginous. Thorax smooth and shining, the metathorax highly polished; the wings subhyaline and iridescent, the stigma and nervures ferruginous. Abdomen ferruginous, smooth and shining.

Hab. Singapore.

6. *TRIGONA APICALIS*. *T. nigra*; clypeo antennisque ferrugineis, parte dimidia basali alarum fusca, apice hyalino.

Worker. Length $2\frac{1}{2}$ lines. Head and thorax black; the abdomen nigro-piceous; the clypeus, and lower parts of the face, testaceous-yellow; the mandibles ferruginous; antennæ pale ferruginous; the head covered with cinereous pile. Thorax: the tegulæ testaceous; the wings from the base to the stigma brown, beyond which they are hyaline; the scutellum covered with short stiff black hairs; the sides, and beneath, with scattered black pubescence; the legs dark rufo-piceous; the posterior tibiæ pale, flattened and widened towards their apex; the outer margin thickly fringed with black pubescence; the disk of the thorax with a cinereous pile; the apex of the abdomen pale rufo-testaceous.

Hab. Borneo (Sarawak).

7. *TRIGONA CANIFRONS*. *T. nigra*; facie pube cinerea vestita; alis hyalinis.

Worker. Length $2\frac{1}{2}$ lines. Black: the face covered with cinereous pile. The thorax thickly covered above with sooty-black pubescence, which is long and tufted on the scutellum; the tegulæ black and shining; the wings hyaline, the nervures testaceous; the posterior tibiæ, with their upper margin, thickly fringed with black hairs. Abdomen shining black.

Hab. Borneo (Sarawak).

8. *TRIGONA COLLINA*. *T. nigra*; antennis basi ferrugineis; alis basi fuscis apice albis.

Worker. Length $2\frac{1}{4}$ lines. Black: the scape, flagellum beneath, and its apex, as well as the mandibles, ferruginous; the clypeus with a pale testaceous spot in the middle; the wings brown at their base as

far as the stigma, beyond which they are milky-white ; the abdomen obscurely rufo-piceous at the base.

Hab. Malacca (Mount Ophir).

9. *TRIGONA FIMBRIATA*. *T.* capite thoraceque femoribus et abdomine basi testaceo-rufis ; tibiis tarsisque intermediis et posticis nigris.

Worker. Length $3\frac{1}{2}$ lines. Head rufo-testaceous, the face covered with very short ochraceous pubescence, and sprinkled with longer stiff black hairs ; the colour and pubescence of the thorax are similar to that of the head, but the disk is of a rather darker colour, and the black hairs are longer and more rigid ; the intermediate and posterior tibiæ, and the basal joints of their tarsi, black, the former densely covered with black pubescence, and the latter thickly fringed with the same, the posterior tibiæ being very broadly dilated towards their apex ; the wings hyaline, their nervures bright ferruginous. Abdomen : the two basal segments rufo-testaceous, their apical margins, as well as the whole of the following segments, nigro-fuscous.

Hab. Singapore.

Fam. FORMICIDÆ.

Before entering upon the descriptions of the highly interesting collection of Ants made by Mr. Wallace in Borneo, Malacca, and Singapore, a few observations may not be out of place. I am perfectly aware, that in treating upon this family, I can only achieve a very partial success ; our present knowledge, scanty as it is, convinces me that it is simply an impossibility to assimilate the sexes of the exotic Ants correctly, without positive observation of their æconomy. The sexes of some species, there can be little doubt, at present form the types of apparently very distinct genera ; such indeed are the eccentricities of form in the exotic species, as to outstrip even the widest bounds hitherto conceived to be necessary to allow, for varieties in form, size and colour. A single instance will amply confirm this observation. In the third volume of the 'Transactions of the Entomological Society,' I described eleven species of the genus *Pseudomyrma* ; of one of these I had the opportunity of describing the three sexes, taken in their fornicarium by Mr. H. W. Bates, in Brazil. This species, *Pseudomyrma cephalica*, exhibits such a remarkable difference of form in the male, female and worker, that, had they not been obtained in the manner stated, I should unhesitatingly have removed the sexes into two distinct genera. In the male and worker the head is of the ordinary form and proportion, but that of the female is as long as the thorax, with the sides parallel ; it is in fact, if I may use the term, so disproportionate, that no one, I imagine, could have

possibly supposed any relationship to have existed between the female and the other sex.

It is to the *Formicidæ* that Mr. Wallace has made the most valuable additions: the number of new species added to the genus *Polyrhachis* is very important, and that of eight to the *Cryptoceridæ* makes a grand addition to that curious and highly interesting family. The new genus, *Echinopla*, being founded on the examination of workers only, will no doubt hereafter require a revision of the characters laid down, but in describing a collection containing so many novelties such occurrences are almost inevitable.

1. *Formica gigas*, Latr. *Hist. Nat. Fourm.* 105. pl. 2. f. 6 ♀.

Hab. Borneo, Malacca, Singapore.

2. *Formica compressa*, Fabr. *Syst. Piez.* p. 396.

Hab. Sarawak.

Specimens from Borneo have the legs more or less red, and in some examples the vertex is more or less so.

3. *Formica stricta*, Jerdon, *Madr. Journ. Lit. & Sci.* (1851) p. 123.

Hab. Borneo (Sarawak).

4. *Formica smaragdina*, Fabr. *Spec. Ins.* 488 ♀.

Formica longipes, Jerdon, *Madr. Journ. Nat. Hist.* 2nd ser. xiii. 104 ♀.

Formica viridis, Kirby, *Trans. Linn. Soc.* xii. 477 ♀.

Hab. Borneo (Sarawak), Malacca, Sumatra, Celebes, Philippine Islands.

5. *FORMICA FESTINA*. *F. nigra*, nitida; flagello fulvo; thorace subtus, metathorace pedibusque et petiolo pallide ferrugineis; abdomine subtus piceo.

Female. Length 9–10 lines. Black and shining: head oblong-quadrate; the mandibles and anterior margin of the face rufo-piceous; the flagellum fulvous. Thorax: beneath, the sides, the metathorax and the legs, pale ferruginous; wings subhyaline, their nervures ferruginous; scæle of the abdomen pale ferruginous, ovate and slightly emarginate above; the posterior margins of the segments of the abdomen, above, pale rufo-testaceous; beneath, entirely pale.

Hab. Borneo (Sarawak).

This species closely resembles the European species *F. ligniperda*—in fact appears to be the exotic form of that insect.

6. *FORMICA MISTURA*. *F. nigro-picea*, ferrugineo variegata, pubescens; capite opaco, thorace abdomineque nitidis.

Female. Length 7 lines. Head black, the vertex and cheeks more or less ferruginous; the head opaque, with the mandibles shining nigro-piceous; the scæpe attenuated, rufo-testaceous; the clypeus delicately punctured, slightly emarginate in front. Thorax elongate-ovate,

smooth and shining, with ferruginous stains in front and on the sides; the metathorax truncate, with ferruginous spots at its base above; the legs ferruginous, the tibiæ and basal joint of the tarsi darkest; the wings flavo-hyaline, the nervures pale rufo-testaceous. Abdomen elongate-ovate, with the margins of the segments and the apex rufo-piceous; the scale ferruginous, with its superior margin very slightly emarginate; the head with a thin fulvous pubescence; the abdomen with a few scattered pale hairs.

Hab. Borneo (Sarawak).

✓ 7. *FORMICA PILOSA*. *F. nigra*, dense sericea pilosa; squama ovata.

Worker. Length 3 lines. Black, covered with a fine cinereous pile: the head large, much wider than the thorax; eyes ovate, placed laterally rather high on the head; the anterior part of the face truncate, the sides produced beyond the anterior margin of the clypeus; a faintly impressed line above the base of the clypeus, which terminates in a shallow fovea on the front. Thorax compressed posteriorly. Abdomen ovate, with a short pale pubescence; the scale narrow, incrassate, and terminating above in a blunt point.

Hab. Borneo (Sarawak).

8. *FORMICA RUFICEPS*. *F. nigra*; capite thoraceque antice ferrugineis.

Worker. Length 4 lines. Head ferruginous, smooth, shining, and much wider than the thorax; the mandibles and scape black, the apex of the former obscurely ferruginous; the flagellum pale rufo-testaceous. Thorax black, more or less ferruginous anteriorly, much compressed towards the metathorax; the tips of the joints of the legs ferruginous, as well as the tarsi. Abdomen black, smooth and shining; the scale ovate, acuminate at its apex above; the legs and apex of the abdomen with a scattered short pale pubescence.

Worker minor, about one-third smaller; only differs otherwise in having the mandibles ferruginous.

Hab. Borneo (Sarawak).

This species bears a strong resemblance to the *F. erratica* of Europe.

3 9. *FORMICA BADIA*. *F. castaneo-fusea*; thorace postice attenuato, abdominis squamula incrassata, abdomine ovato.

Worker. Length $2\frac{1}{2}$ – $3\frac{1}{2}$ lines. Chestnut-brown; head subovate; the eyes ovate, lateral, placed high on the head towards the vertex. Thorax rounded in front, compressed behind; the metathorax obliquely truncated; the scale of the abdomen subconical, incrassate, slightly rounded in front and truncate behind. Abdomen oblong-ovate, the apex fuscous.

Hab. Singapore; Borneo (Sarawak).

This species has much the appearance of a species of *Polyergus*; but the mandibles are toothed at the apex: the palpi I have not examined.

10. *FORMICA DILIGENS*. *F.* obscure rufo-picea; antennis, mandibulis, thorace subtus et lateribus, metathorace pedibusque late rufis; abdomine subtus pallide rufo-testaceo.

Female. Length 9 lines. Head shining, dark rufo-piceous; the carinae at the insertion of the antennae, the antennae, the anterior margin of the face and clypeus, and the mandibles, ferruginous. The thorax and legs ferruginous, with the mesothorax above and the scutellum dark rufo-piceous; wings subhyaline, the nervures and tegulae pale ferruginous. Abdomen shining dark rufo-piceous, beneath pale rufo-testaceous; scale subquadrate, its superior margin slightly emarginate its entire width.

Hab. Malacca.

This insect closely resembles the *F. ligniperda*.

- ✓ 11. *FORMICA IRRITANS*. *F.* capite abdomineque nigro-fuscis; antennis, thorace, abdomine, squamula pedibusque ferrugineis.

Worker. Length 6 lines. Elongate and slender; head ovate; dark fuscous; the apex of the scape and the flagellum ferruginous; the clypeus and mandibles dark rufo-piceous. The thorax, scale of the abdomen and the legs, ferruginous; the thorax elongate, compressed, with the prothorax very slightly dilated at the sides. The scale of the abdomen incrassate, rounded anteriorly and truncate behind. Abdomen ovate, nigro-fuscous; the entire insect sprinkled with erect pale hairs.

Worker minor. Length 3 lines. Only differs in having the antennae entirely pale ferruginous and the anterior legs stouter.

Hab. Malacca; Borneo (Sarawak).

This is probably the worker of *F. diligens*.

12. *FORMICA FERVENS*. *F.* capite abdomineque obscure rufo-piceis, thorace pedibusque pallide ferrugineis.

Worker. Length 4 lines. Head nigro-piceous, thorax and legs pale ferruginous; head subopake, with the mandibles and clypeus slightly shining, the latter with scattered punctures; the flagellum pale ferruginous; the anterior margin of the clypeus slightly emarginate. Thorax more or less fuscous in front, compressed behind. Abdomen black and shining, with the apical margins of the segments narrowly testaceous; thinly sprinkled with pale hairs; the scale ovate and ferruginous.

Hab. Borneo (Sarawak).

13. *FORMICA GRACILIPES*. *F.* ferruginea, abdomine (basi excepto) obscure rufo-piceo.

Worker. Length 2 lines. Pale ferruginous, abdomen dark rufo-piceous; antennae longer than the body; head ovate, and wider than the thorax, narrowed behind; the eyes black and prominent. Thorax elongate and compressed; the prothorax narrowed into a slender neck;

legs very much elongated, the posterior pair one-third longer than the insect, the tibiæ and tarsi pale testaceous; the abdominal scale incresate, rounded in front and truncate behind; the abdomen dark rufopiceous, short and ovate; the base more or less pale ferruginous.

Hab. Singapore.

14. *FORMICA IRRITABILIS*. *F.* capite, thorace et squama sanguineis; pedibusque rufo-fuscis; abdomine fusco-nigra.

Worker. Length 4 lines. Head, thorax, and scale of the abdomen ferruginous, the abdomen black; the scape black, its extreme base and apex, and the flagellum, ferruginous, the latter more or less fuscous above; the vertex with sometimes a fuscous stain; the mandibles nigro-piceous, their apex ferruginous; the thorax compressed behind, and thinly covered, as well as the head, with erect reddish hairs; legs nigro-fuscous, with the base and apex of the joints, or with sometimes the coxæ and base of the femora, and also the apical joints of the tarsi, ferruginous. The scale of the abdomen ovate, terminating in a point above; the apical margins of the segments with a thin fringe of pale reddish-yellow hairs.

Hab. Borneo (Sarawak).

15. *FORMICA SEDULA*. *F.* capite thorace pedibusque opacis nigris, abdomine castaneo.

Worker. Length 5 lines. Head and thorax opaque-black, the mandibles and legs shining black; the abdomen chestnut-red. The mandibles smooth at their base, and striated at their apex, with five stout teeth, the flagellum fusco-ferruginous; the head deeply emarginate behind; much wider than the thorax; the thorax compressed; the trochanters and apical joints of the tarsi ferruginous. Abdomen ovate and thinly sprinkled with reddish pubescence; the scale subquadrate; emarginate above, and slightly ferruginous; the head and thorax with a few erect black hairs.

Hab. Borneo (Sarawak).

Resembles *F. compressa*, but differs in having much stouter legs, in being pubescent, in having the posterior angles of the head more rounded, and in being pubescent.

16. *FORMICA EXASPERATA*. *F.* capite thorace abdominisque squama sanguineis; tarsorum unguibus abdominisque basi rufis; thorace compresso.

Worker. Length $5\frac{1}{2}$ lines. Head and thorax blood-red; sometimes blackish before the insertion of the antennæ, and also a little in front of the anterior stemma; in some examples entirely red; the mandibles black, stout, strongly toothed and punctured; the head deeply emarginate posteriorly, and much wider than the thorax. Thorax: compressed, sometimes with fuscous stains at the sides, with the tibiæ and tarsi more or less fuscous; the head, thorax and legs with a thin scattered pale reddish pubescence. Abdomen: black, subopaque,

with the apical margins of the segments usually more or less rufo-piceous; the scale erect, ovate and entire.

Hab. Borneo (Sarawak).

The general form of this species is that of *F. compressa*; the antennæ are shorter, with shorter joints, and the legs are considerably stouter.

Hab. Borneo (Sarawak).

17. *FORMICA TENUIPES.* *F. castaneo-rufa* lævis nitida; thorace ovato; alis hyalinis; squama quadrata supra emarginata.

Female. Length 4 lines. Reddish-brown: mandibles stout, and armed with five stout black teeth; antennæ pale rufo-testaceous. Thorax ovate, smooth and shining; wings hyaline, the nervures pale testaceous; legs pale rufo-testaceous, with the femora much compressed, flattened; the scale of the abdomen quadrate, emarginate above. Abdomen ovate, smooth and shining.

Hab. Borneo (Sarawak).

18. *FORMICA CAMELINA.* *F. nigra*, elongata et gracilis; capite postice in collum angustato; thorace medio compresso; metathorace supra rotundato; pedibus elongatis; abdominis nodo globoso.

Worker. Length 5 lines. Black: elongate and slender; covered with a fine silky pile, which has a golden tinge on the thorax and abdomen; the antennæ nearly as long as the body; the head oblong, much narrowed behind the eyes, the latter nearly round, and placed rather forwards on the face a little higher than the insertion of the antennæ; the carinæ above the clypeus with a less elevated one between them, the antennæ inserted at the sides of the carinæ. Thorax: much narrowed in front, forming a sort of neck, widened and rounded behind, broader than the meso- and meta-thorax, the latter somewhat swollen above and elevated above the anterior part of the thorax; legs very long and sprinkled with fine whitish hairs. The scale of the abdomen, viewed above, pear-shaped, broadest at the base; abdomen ovate, pointed at the apex, and sprinkled with pale glittering hairs.

Hab. Singapore.

19. *FORMICA PALLIDA.* *F. pallide testacea* lævis nitida sparse pilosa; squamula elongato-ovata.

Worker. Length $2\frac{1}{2}$ –3 lines. Pale rufo-testaceous, smooth and shining; the head much wider than the thorax, the vertex widely and deeply emarginate; the mandibles dark rufo-piceous; the flagellum and the legs paler than the rest of the body; the thorax compressed behind; the scale narrow and ovate; abdomen subglobose, and thinly sprinkled with long pale hairs; the head and thorax also slightly pubescent.

Hab. Borneo (Sarawak).

Some individuals of this species differ from the form described, in having the head and abdomen of a deeper hue; the prothorax is sometimes

dark, but all have the scale of the same elongate-ovate form, without any notch above.

20. *FORMICA IRRITANS*. *F. nigra*; *antennis*, *thorace pedunculisque squama ferrugineis*.

Worker. Length 6 lines. Head and abdomen nigro-fuscous; antennæ, thorax, and scale of the abdomen, as well as the legs, ferruginous. Elongate and slender, the head ovate; the apex of the scape ferruginous; the clypeus and mandibles dark rufo-piceous. The thorax elongate, compressed, with the prothorax slightly dilated at the sides. Abdomen ovate: the scale incrassate, rounded anteriorly, and truncate behind; the entire insect thinly sprinkled with erect, long, pale pubescence.

Worker (minor). Length 3 lines. This only differs in having the antennæ entirely pale ferruginous.

Hab. Borneo (Sarawak).

This is probably the worker of *Formica diligens*.

GENUS *TAPINOMA*, *Foerster*.

1. *TAPINOMA GLABRATA*. *T. nigra*, *subnitida*, *glabra*, *angustior*; *antennis*, *mandibulis tarsisque rufo-pallidis*; *squama oblonga depressa*; *abdomine oblongo-ovato*.

Worker. Length $1\frac{1}{2}$ line. Black: the clypeus obscurely testaceous; the mandibles and flagellum rufo-testaceous, the apex of the latter slightly fuscous; the head, prothorax, and coxæ beneath, rufo-testaceous; the thorax declining above to the base of the metathorax, the latter convex; the tarsi pale rufo-testaceous. Abdomen ovate; the scale inclining forwards in a line with the oblique truncation of the metathorax; the insect entirely destitute of pubescence.

Hab. Malacca.

GENUS *POLYRHACHIS*.

Body more or less armed with spines. *Antennæ* elongate, usually nearly as long as the body; *labial palpi* 4-jointed, the basal joint shortest, the three following, each in succession, longer than the preceding; the apical joint three times the length of the basal one. *Maxillary palpi* 6-jointed, elongate, the basal joint short, about half the length of the second joint, each of the following joints more than twice the length of the second joint. *Thorax*: subovate in the females; compressed and frequently flattened above in the workers; *wings* as in *Formica ligniperda*. *Abdomen* globose. (Details, Plate I.)

This genus of Ants, of which the *Formica bihamata* may be regarded as the type, forms a very distinct section of the *Formicidæ*: the males I am not acquainted with. The habit of these insects is arboreal, as we learn from Mr. Jerdon, who, in his paper on Ants, in the Madras Journal, describes two species; of

one, *P. nidificans*, he says, "This Ant makes a small nest about half an inch or rather more in diameter, of some papyraceous material, which it fixes on a leaf; I have opened two, each of which contained one female and eight or ten workers. It is very rare; I have only seen it in Malabar." What can be the use of the formidable spines and hooks with which these creatures are armed, it is impossible to determine; on examination we find, as might be expected in species living on trees, and probably all have the same habit, that the legs are destitute of spines, and usually of pubescence also; the calcaria at the apex of the tibiae are very short, and the tips of the tarsal joints have very short spines and hairs.

The *Polyrhachis textor*, described in these papers, was captured with its nest, and was sent from Malacca by Mr. Wallace; the nest is nearly oval, not quite an inch in length, its shortest diameter being a little over half an inch; this nest is not of a papyraceous texture, but fibrous, formed, as it were, of a coarse network; the colonies must consequently be very small, as Mr. Jerdon says, consisting of only eight or ten individuals; but probably at the height of the season, when the males appear, the nests may be somewhat enlarged, as we know to be the case amongst the social Wasps.

Although these insects are usually rare, or at least seldom met with in collections, Mr. Wallace has captured no less than nineteen species in the East: from the New World I have only seen one or two, about four from Africa, and the same number from Australia.

1. POLYRHACHIS BIHAMATUS, *Drury, Ins.* ii. pl. 38. f. 8 ♀.

P. thorace quadrispinoso, squama petiolari spinis duabus arcuatis.

Hab. Borneo. India. Sumatra.

2. *Polyrhachis relucens*.

Formica relucens, *Latr. Hist. Nat. Fourm.* p. 131.

Hab. Borneo (Sarawak). India.

3. *Polyrhachis carinatus*.

Formica carinata, *Fabr. Syst. Piez.* 413. 71; *St. Farg. Hym.* i. 220. 28;

Jerdon, Madras Journ. Lit. & Sc. (1851).

Hab. Malacca. Singapore.

4. POLYRHACHIS DEFENSUS. *P.* niger; capite thoraceque minute verrucatis, thorace spinis duabus longis antice, duabus postice, armato; abdomine opaco ferrugineo-ruf.

Worker. Length $3\frac{1}{2}$ lines. Head and thorax black, and coarsely sha-

greened; the thorax armed with two long stout spines at the angles of the prothorax, and two similar ones at the posterior angles of the metathorax; the scale of the abdomen with two long stout spines diverging and curved backwards. Abdomen globose, of a dull opake rusty-red.

Hab. Singapore. Java.

Specimens from Java, in the British Museum, have the abdomen black.

5. *POLYRHACHIS CONSTRUCTOR*. *P. niger*; thorace ovato, spinis duabus minutis antice armato; abdominis squamula spinis duabus armata.

Female. Length $3\frac{1}{2}$ lines. Black: finely rugose; the palpi pale testaceous; the mandibles obscurely rufo-piceous; the apex of the antennæ pale rufo-testaceous. Thorax: the anterior angles of the prothorax acute; the metathorax not toothed; the apex truncate, the truncation finely rugose; wings subhyaline, faintly yellow; the nervures pale testaceous. Abdomen globose; the scale quadrate, with two very stout, short, curved spines above; the insect is very thinly covered with a fine short silky ashy pile, most apparent on the abdomen.

Hab. Borneo (Sarawak).

6. *POLYRHACHIS RUFICORNIS*. *P. niger*; antennis mandibulis pedibusque ferrugineis, abdominis squamula spinis duabus longis armata.

Female. Length 4 lines. Black: the antennæ and mandibles ferruginous. Thorax elongate-ovate; wings subhyaline and iridescent, the nervures testaceous; the legs ferruginous, the coxæ black. Abdomen: the base more or less ferruginous; the scale with two stout divergent spines above, which curve slightly backwards.

Hab. Borneo (Sarawak).

7. *POLYRHACHIS CARBONARIUS*. *P. aterrimus*, nitidus; capite thoraceque supra aciculatis, abdominis squamula supra fornicata.

Worker. Length 2 lines. Jet-black, shining: the head and the thorax above, longitudinally aciculate, the thorax most finely so. Thorax: the anterior margin of the thorax with a short acute spine at the lateral angles; the truncation of the metathorax smooth and shining; the legs elongate, with acute spines or hairs; the calcaria pale testaceous; the anterior tibiæ obscurely ferruginous in front. Abdomen ovate, smooth and shining; the scale incrassate, narrowed to a sharp edge above, the superior margin wide and arched, not spined.

Hab. Malacca.

8. *POLYRHACHIS TEXTOR*. *P. niger*; thorace elongato, supra planato, dentibus duobus parvis antice et postice armato; abdominis pedunculo unispinoso.

Worker. Length $3\frac{1}{2}$ lines. Black; delicately rugulose; the eyes ovate, lateral, placed high on the sides of the head; the front with two raised carinæ, at the sides of which the antennæ are inserted; the

clypeus and the space between the antennæ, rufo-piceous; the clypeus with a slight longitudinal carina; the mandibles obscurely rufo-piceous at their apex; the apical joint of the antennæ ferruginous. Thorax elongate, compressed at the sides, and flattened above; the anterior portion longitudinally aciculate; the meso- and meta-thorax delicately rugulose; a short blunt tooth or spine on each side of the prothorax, and a similar, but more acute tooth at the superior angles of the metathorax; the legs elongate, without spines or hairs; the tips of the claw-joint of the tarsi ferruginous. Abdomen smooth and shining; the peduncle with a single acute spine above, and a minute tooth on each side at its base.

Hab. Malacca.

9. *POLYRHACHIS CHALYBEUS*. *P. capite thoraceque nigris, pedibus abdomineque chalybeis.*

Worker. Length 4 lines. Black: the metathorax, legs and abdomen steel-blue; the head delicately rugulose; eyes ovate, lateral, placed high on the head; the antennæ inserted opposite the lower orbit of the eyes, each at the side of an elevated bent carina; the clypeus emarginate anteriorly; the mandibles large and stout, their apex denticulate. Thorax elongate, delicately transversely rugulose, with two stout acute spines in front, diverging outwardly, and two shorter erect parallel ones on the metathorax; the femora and tibiæ compressed. Abdomen smooth and shining; the peduncle armed with two long stout divergent bent spines which curve backwards.

Hab. Singapore. Malacca.

10. *POLYRHACHIS NITIDUS*. *P. nigerrimus, lævis, nitidus; thorace ovato, metathorace spinis duabus longis acutis, pedunculo quadrato, spinis duabus curvatis acutis armato.*

Female. Length 4 lines. Jet-black, smooth and shining; the thorax rounded anteriorly; the metathorax armed with two long acute spines at its base; the truncation delicately transversely rugulose and shining; the peduncle quadrate, armed above at its posterior angles with two short curved acute spines; the anterior tibiæ rufo-piceous in front; wings subhyaline, faintly tinted with yellow; the nervures ferruginous; the stigma brown. Abdomen subglobose, very smooth and shining.

Hab. Borneo (Sarawak).

11. *POLYRHACHIS VILLIPES*. *P. niger; thorace spinis duabus elongatis acutis antice armato; abdominis squamula spinis duabus longis acutis, singulis basi minute unispinis, pedibus pubescentibus.*

Worker. Length $3\frac{1}{2}$ –4 lines. Black: the head and thorax longitudinally delicately aciculate; eyes ovate, very prominent, situated high on the sides of the head, the head narrowed posteriorly; the carinæ on the face much elevated; the palpi pale rufo-testaceous. Thorax: armed in front with two long acute divergent spines; posteriorly unarmed; the superior surface flattened, distinctly divided by two trans-

verse sutures, and having a curved decline to the verge of the truncation of the metathorax; legs elongate, with a thin clothing of erect pubescence. Abdomen smooth, shining, and sprinkled with erect black hairs; the surface of the peduncle in front subquadrate, narrowed at the base, the superior angles with long acute divergent spines, which have a minute spine at their base outside.

Hab. Borneo (Sarawak).

12. *POLYRHACHIS MODESTUS*. *P. niger*; thorace ovato, metathorace spinis duabus brevibus obtusis, squama spinis duabus acutis retrorsum curvatis armata.

Female. Length 3 lines. Black: head and thorax very delicately rugose; the flagellum rufo-piceous beneath towards the apex. Thorax ovate; the metathorax with two short blunt spines; wings hyaline, faintly yellow; the nervures pale testaceous; the apical joints of the tarsi obscurely ferruginous. Abdomen globose, smooth and shining; the scale quadrate, armed above at the lateral angles with two acute spines which curve backwards.

Hab. Singapore.

13. *POLYRHACHIS PANDARUS*. *P. opacus niger*; capite thoraceque subverrucatis, thorace antice posticeque abdominisque squama spinis duabus longis crassis acutis armatis.

Worker. Length 4 lines. Black: head and thorax coarsely shagreened; the palpi pale testaceous; head below the antennæ finely shagreened; the head with a sharp recurved margin posteriorly. Thorax: not flattened above; two long, stout, acute, divergent spines in front, and two similar ones posteriorly; the scale quadrate, with two long acute divergent spines, directed backwards; legs without spines or hairs; the calcaria, at the apex of the anterior tibiæ, pale testaceous, those on the intermediate and posterior pairs black. Abdomen smooth, opaque-black.

Examples of this species from Singapore have the abdomen rusty-red.

Hab. Borneo (Sarawak). Philippine Islands. Java.

14. *POLYRHACHIS HECTOR*. *P. opacus niger*; thorace spinis duabus longis acutis antice et postice armato; squama quadrata spinis duabus longis curvatis; abdomine obscure ferrugineo.

Worker. Length 4 lines. Opaque-black: delicately shagreened; the head narrowed posteriorly; the thorax armed with two long acute divergent spines in front, and two slightly divergent ones behind; the scale quadrate, with two long divergent spines above which curve backwards; the legs without spines or pubescence, the calcaria black. Abdomen with an obscure ferruginous tinge. Thorax not flattened above.

Hab. Singapore.

15. *POLYRHACHIS LÆVIGATUS*. *P. niger*, lævis, nitidus; metathorace

spinis duabus longis acutis retrorsum directis; abdominis squama spinis duabus curvatis armata; coxis femorumque basi rufis.

Worker. Length $2\frac{1}{2}$ lines. Black, smooth and shining: the flagellum thickened towards the apex. Thorax: the anterior angles acute; the disk not flattened; the metathorax with two long, acute, divergent spines, directed backwards; the scale with a long curved spine on each side, directed to the curve of the abdomen; the coxæ and femora ferruginous, the anterior pair obscure. Abdomen globose, smooth and shining.

Hab. Malacca.

I have only seen a single specimen of this species: the clavate antennæ appear to indicate its belonging to a different genus.

16. *POLYRHACHIS CUSPIDATUS.* *P. niger*; prothorace metathoraceque medio elevatis et bispinosis; femoribus abdominisque basi ferrugineis.

Worker. Length $2\frac{1}{2}$ lines. Black: head subovate, not narrowed behind; the base of the scape, the apex of the flagellum, and the tips of the mandibles, ferruginous. Thorax slightly compressed; the prothorax with an elevation in the middle which terminates above in two divergent spines; there is also a similar elevation, spined above on each side, on the metathorax; the coxæ, femora, and apical joints of the tarsi, ferruginous. Abdomen ferruginous at the base; the scale quadrate, deeply notched above.

Hab. Borneo (Sarawak).

17. *POLYRHACHIS FLAVICORNIS.* *P. niger*; capite thoraceque subopacis, abdomine nitido; flagello femorumque basi flavo-testaceis.

Female. Length 3 lines. Black: the head subopake, the flagellum and mandibles reddish-yellow; the basal joint of the flagellum, except its extreme apex, black; the scape rufo-piceous. Thorax subopake; ovate, without spines; legs rufo-piceous, the femora pale reddish-yellow; wings subhyaline, nervures pale testaceous, stigma brown. Abdomen fuscous; the scale quadrate, armed with two short, curved subacute spines.

Worker. Length 2 lines. Very like the female, but with the antennæ and legs of a deeper tint; the first joint of the flagellum black, except its apex; the thorax flattened at the sides, the superior surface slightly convex, divided by two transverse sutures, the margins acute. Abdomen globose, black and shining; the scale as in the female.

Hab. Singapore.

18. *POLYRHACHIS EQUINUS.* *P. niger nitidus*; thorace supra depplanato, metathorace et pedunculo bispinosis, pedibus pallide ferrugineis.

Worker. Length 3 lines. Black; head shining and delicately rugulose; the palpi pale rufo-testaceous. Thorax: flattened above, the margins acutely edged; the sides longitudinally delicately striated; the pro-

thorax, above, slightly concave, and shaped like a horse-shoe; the metathorax is also slightly concave, with the posterior angles acute and elevated; the metathorax smooth and shining behind; the legs rufo-testaceous. Abdomen: smooth, shining and subglobose; the scale elevated, with two short teeth above, the sides oblique; the scale narrowing to its base.

Hab. Sarawak.

19. *POLYRHACHIS DIVES*. *P. niger*, aureo-sericeo vestitus; thorace spinis acutis antice et postice armatis; squama quadrata spinis duabus longis curvatis.

Worker. Length $2\frac{1}{2}$ lines. Black: clothed with pale golden pubescence; the thorax with two short curved spines in front, and two of about the same length at its posterior margin; the scale of the abdomen compressed, square in front, and having two long spines which curve backwards; the pubescence on the head and thorax with an obscure golden tinge; the legs without spines or pubescence; the calcaria pale testaceous.

Hab. Singapore.

20. *POLYRHACHIS VINDEX*. *P. niger*, subnitidus; thorace supra deplanato, spinis duabus anterioribus; squama integra; pedibus ferrugineis; tibiis et femoribus apice tarsisque fuscis.

Worker. Length $2\frac{1}{2}$ lines. Black: the head and thorax with a shining hoary pile; the head longitudinally striated; the apex of the flagellum beneath, and the palpi, pale rufo-testaceous. Thorax flattened above, delicately striated longitudinally; the divisions of the thorax distinctly marked by two transverse sutures; the lateral margins raised and acute; the anterior angles produced into acute spines; the tibiæ and femora ferruginous, and more or less fuscous at their apex. The scale of the peduncle incrassate, compressed to a sharp edge above, which is rounded, and terminates in a minute tooth laterally. Abdomen smooth, shining and subglobose.

Hab. Borneo (Sarawak).

Subfam. PONERIDÆ.

Gen. ODONTOMACHUS, *Latr.*

1. *ODONTOMACHUS RIXOSUS*. *O. rufo-fuscus*, femoribus pallide testaceis; margine interna mandibulorum subserrata, thorace transversim striato.

Worker. Length $4\frac{1}{2}$ lines. Reddish-brown: the coxæ, trochanters and femora pale testaceous, the extreme base, and apex of the latter, darker; the mandibles with two blunt teeth at their apex, the outer tooth notched on one side, forming a second tooth; the inner edge slightly serrated, having only four or five minute teeth; the prominence between the sulcations on the anterior part of the head,

obliquely striated; the striations crossing the sulcations, but terminating opposite the hinder margin of the eyes; the depression on the sides of the head striated, the striation becoming obsolete at the sides of the head. The thorax transversely striated, the metathorax most strongly so. The scale of the abdomen conical, terminating above in an acute spine; the abdomen very smooth and shining, the apex pale testaceous.

Hab. Singapore.

This species bears a strong resemblance to the type of the genus, *O. hamatodes*, a South American insect; but that species has the head shorter, and the vertex delicately striated; the antennæ are shorter, the joints shorter: specimens which I consider to be identical with the present species, are in the collection at the British Museum, from Birmah and Singapore.

2. *ODONTOMACHUS RUGOSUS*. *O. rufescenti-fuscus*; capite supra longitudinaliter striato, lateribus lævibus nitidis, thorace pedunculoque rude rugosis.

Worker. Length 3 lines. Head of a red-brown, the mandibles and scape rather paler, the flagellum pale testaceous; the mandibles much narrowed at their base, their inner edge finely serrated, terminating in two long blunt teeth which are abruptly curved at right angles with the jaws; the head a little longer than broad, deeply emarginate behind, longitudinally striated above, the sides smooth and shining. Thorax darker than the head, and coarsely rugose; the legs ferruginous. The node of the abdomen conical and rugose; abdomen smooth and shining and of a dark rufo-piceous colour, the apex pale.

Hab. Singapore.

This is a very remarkable and distinct species, both in sculpture and form.

GEN. PONERA, Latr.

1. *PONERA VERSICOLOR*. *P. purpureo et violaceo variegata seu obscure cerata*; capite, thorace abdominisque basi profunde striatis; nodo spinis duabus parvis armato.

Worker. Length $4\frac{1}{2}$ lines. Black, with purple, violet and green tints in different lights: the head deeply striated longitudinally, the striæ terminating at the base of the clypeus, the anterior margin of which is subangular; the mandibles obscure ferruginous, their inner edge toothed, the teeth being alternately one large and one small; the mandibles finely striated; the eyes ovate, of moderate size, placed laterally about the middle. Thorax: in front with deep circular striæ, behind which are a few longitudinal ones on the disk; the sides and posterior portion obliquely striated, the apex transversely so; the calcaria and apical joints of the tarsi ferruginous. The node of the abdomen incrassate, rounded in front and above, and truncate behind,

with two short sharp spines on the verge of the truncation, pointing backwards; the first segment with transverse curved striæ.

Hab. Borneo (Sarawak). Philippine Islands.

Some specimens of this species are entirely of a bronze-green, and some have the legs more or less red.

2. *PONERA RUBRA*. *P. castanco-rubra*, lævis et impunctata; abdomine elongato-ovato, nodo elevato antice rotundato, postice truncato.

Female. Length $3\frac{1}{2}$ lines. Bright chestnut-red; the head smooth and impunctate; the head dusky before the ocelli; the mandibles serrated on their inner margin; the antennæ about the length of the thorax, slightly thickened towards their apex. Thorax: the disk slightly fuscous; narrowed towards the metathorax, which is obliquely truncate, the truncation smooth and shining; the anterior margin of the prothorax rounded. The peduncle of the abdomen, viewed sideways, is wedge-shaped, its front margin slightly rounded, behind truncate; the abdomen elongate-ovate, pointed, and slightly pubescent at the apex.

Hab. Singapore.

3. *PONERA APICALIS*. *P. nigra*; antennis mandibulis pedibus abdonis apice ferrugineis.

Female. Length $3\frac{1}{2}$ lines. Black: the antennæ, mandibles, legs and apex of the abdomen ferruginous; the head finely shagreened. Thorax oblong-ovate, finely longitudinally rugulose; the sides of the metathorax coarsely rugose, the truncation transversely striated; the scale of the abdomen incrassate, rounded above, transversely striated in front and behind; the abdomen smooth and shining, with a thin fine grey pubescence.

Hab. Borneo (Sarawak).

4. *PONERA IRIDESCENS*. *P. rufo-fusca*, lævis, nitida, chalybeo-iridescent; antennis pedibusque ferrugineis.

Worker. Length $2\frac{1}{2}$ lines. Dark rufo-fuscous, with changeable tints of blue on the head and thorax, in different lights; the apex of the metathorax, the legs, antennæ, and apical margins of the segments of the abdomen, ferruginous; the head with an abbreviated impressed line above the insertion of the antennæ; the mandibles with their inner margin serrated and three teeth at their apex; the scale of the abdomen compressed, elevated, and rounded above. Abdomen oblong; the apical margin of the first segment slightly constricted.

Hab. Borneo (Sarawak).

5. *PONERA RUGOSA*. *P. ferruginea rude rugosa*; capite thoraceque profunde punctatis; abdomine rude sulcato et punctato.

Female. Length $3\frac{1}{4}$ lines. Ferruginous; the head covered with coarse deep punctures, the punctures semi-confluent; the antennæ short and thick; the flagellum clavate and pubescent; the mandibles longitudinally

grooved. Thorax oblong, widest in front, the anterior margin curved, the lateral angles acute; the metathorax truncate; the prothorax with large deep confluent punctures; the mesothorax longitudinally grooved; the scutellum and metathorax ruggedly punctured. The abdomen longitudinally grooved, the grooves on the basal segment punctured; the node rugged and subglobose, beneath, furnished with a remarkable flattened semitransparent appendage.

Hab. Borneo (Sarawak).

6. *PONERA RUFIPES*, *Jerdon*. *P. atro-fusca*; capite thorace nodoque rugosis; abdomine longitudinaliter rude sulcato, pedibus abdominisque apice ferrugineis.

Worker. Length 5 lines. Obscure fuscous, scarcely black; the mandibles, the apex of the scape and of the flagellum, the legs and apex of the abdomen, obscurely ferruginous; the head, thorax, and node of the abdomen, rugose; the eyes small, placed forwards on the sides of the head; the antennæ short and thick, the flagellum clavate; two parallel longitudinal carinæ running backwards from the insertion of the antennæ to within about one-third of the posterior margin of the head. The thorax obliquely truncated behind, the truncation smooth and slightly shining; the truncation of the abdominal node smooth and shining, its margin denticulated; the abdomen coarsely grooved longitudinally.

Hab. Singapore. Malabar.

Specimens of this species from Borneo have the legs nearly or quite black.

7. *PONERA INTRICATA*. *P. nitida nigra*; capite, thorace abdominisque basi profunde et æqualiter striatis; nodo spinis duabus acutis armato; pedibus ferrugineis.

Worker. Length 5 lines. Black and shining; the mandibles, legs, and apex of the abdomen, ferruginous; the flagellum obscurely ferruginous; the head evenly and deeply grooved, longitudinally on the face, and transversely on the vertex; the antennæ as long as the insect. Thorax: the dilated portion with transverse grooves on the disk which are enclosed by curved ones; the thorax is much compressed, with a longitudinal groove above, the sides obliquely striated; the oblique truncation at the apex transversely striated. The node of the abdomen compressed, rounded above and in front, and obliquely grooved; the margin of the truncation with two acute spines above directed backwards; the basal segment of the abdomen with curved striæ, slightly impressed or obliterated at the sides; the apical margins of the segments rufo-piceous.

Hab. Borneo (Sarawak).

8. *PONERA GEOMETRICA*. *P. nigro-ænea*; capite, thorace abdominisque basi profunde striatis, nodo spinis duabus acutis armato.

Worker. Length 5 lines. Black, with more or less of a bronze tint; the head longitudinally striated; the clypeus angulated in front; the

mandibles ferruginous. Thorax: rounded anteriorly; the disk in front transversely striated, these striæ encircled by others which pass round the sides and front; the thorax beyond with a striation, which runs in an elongated oval direction, the sides obliquely striated; the legs very obscurely ferruginous. Abdomen: the node incrassate, rounded in front and above, truncated behind; the margin of the truncation deeply emarginate, the lateral angles of the emargination produced into long stout acute spines; the node with a curved striation, the curve being forwards; the first segment with a beautiful even curved striation; the apical segments smooth and shining, covered with a cinereous silky pubescence.

Hab. Singapore.

This species resembles the *P. versicolor*, but is much more regularly and evenly striated; the striation on *P. versicolor* is coarse and uneven, and directed differently on the thorax; the joints of the antennæ in this species are also longer and more slender. T. C. Jerdon has described a striated species of *Ponera*, but he says, "abdominal pedicle raised, pointing forwards with two small spines"—which does not agree with any of the insects here described.

9. *PONERA TRANSVERSA*. *P.* obscure rufo-fusca; thorace supra transverse rugoso; pedunculo margine supra emarginato.

Worker. Length 4 lines. Black: the head deeply striated, the striæ on the vertex diverging from the centre; the antennæ scarcely as long as the thorax, inserted at the side of two ridges at the base of the clypeus; the elevations, extreme base of the scape, and the mandibles, obscurely ferruginous. Thorax elongate, the sides straight, slightly narrowed from the front towards the abdomen; the margin of the thorax, in front, rounded, the lateral angles furnished with a short obtuse spine; the thorax is transversely striated its entire length; the verge of the oblique truncation at the apex with two very short obtuse spines; the legs ferruginous. Abdomen obscurely rufo-piceous, covered with a fine cinereous pile, and sprinkled with long pale hairs; the scale, when viewed sideways, is wedge-shaped, the upper edge deeply notched, and the scale transversely striated behind.

Hab. Singapore.

10. *PONERA VIDUA*. *P.* rufescenti-fusca; antennis elongatis; thorace ovato, postice truncato; alis hyalinis; abdominis nodo incrassato, subtus spinis duabus parvis armato.

Male. Length 4 lines. Red-brown: antennæ elongate, fusco-ferruginous, the base, and apex of the joints, pale testaceous; the eyes large and ovate, the ocelli large and of glassy brightness. Thorax ovate, with a thin loose downy pubescence; the metathorax truncate, the sides rugose; wings hyaline, the nervures pale yellow, with the

stigma brown; the legs pale testaceous. Abdomen smooth and shining, with thin scattered long pale pubescence, most dense towards the apex; a deep strangulation between the first and second segments; the node incrassate, coarsely rugose, rounded in front and above, truncate behind; beneath furnished with two short teeth.

Hab. Borneo (Sarawak).

11. *PONERA DIMINUTA*. *P. nigra*; vertice delicatule curvato-striato; pedibus rufo-piceis; abdomine levigato nitido squama quadrata.

Worker. Length 3 lines. Black: the mandibles, and the extreme base of the scape, ferruginous; the flagellum fusco-ferruginous; the head elongate, narrowed behind, delicately striated; the striae curved transversely on the vertex. Thorax elongate, produced into a neck anteriorly; swollen in front, compressed in the middle, and again widened to the apex, which is obliquely truncated; the truncation with a few deep transverse striae; the thorax above with short irregular scratches or abbreviated striae; the legs elongate, rufo-piceous, the tarsi pale. Abdomen: the scale, viewed laterally, is quadrate; above slightly narrowed in front, and truncated before and behind; the first segment rounded at the base and constricted at the apex, the second segment narrowed at the base; the abdomen smooth and shining, with the apical margins of the segments, and the apex, rufo-piceous.

Hab. Borneo (Sarawak).

This species is nearly an exact representative in form, on a reduced scale, of the *P. tarsata*.

12. *PONERA POMPILOIDES*. *P. nigra*, *Pompilum simulans*; thorace elongato-ovato; abdomine elongato nodo conico.

Male. Length 3 lines. Black: antennae elongate, and finely pubescent. Thorax in front and behind obscurely ferruginous; the wings subhyaline, the nervures pale testaceous, the stigma brown; the apex of the coxæ, and the base of the femora, rufo-piceous; the apical joints of the tarsi pale ferruginous. Abdomen elongate, with a scattered pale downy pubescence; the apical margin of the first segment slightly constricted; the node conical and rufo-piceous.

Hab. Borneo (Sarawak).

13. *PONERA LÆVICEPS*. *P. nigra*; capite elongato lævi nitido; thorace abdomineque levigatis nitidis; tarsis pallidis ferrugineis.

Worker. Length 3 lines. Black, smooth and shining; a few striae on the face on each side of the clypeus; the latter triangular, with a central raised longitudinal carina; a longitudinal impressed line runs from the insertion of the antennae half-way towards the posterior margin of the vertex. Thorax: in front forming a short neck, behind which it is swollen; from thence it is much narrowed and compressed; the apex oblique and transversely rugose; the tarsi pale

rufo-testaceous; the abdomen with a deep strangulation between the first and second segment; the node elevated and rounded above.

Hab. Borneo (Sarawak).

Gen. TYPHLOPONE, *Westw.*

1. TYPHLOPONE LÆVIGATA. *T. castanea nitida lævigata*, capite in medio sulcato.

Worker. Length 4 lines. Chestnut-red: smooth and shining, longitudinally channeled, slightly interrupted, in some examples, near the margin of the vertex; the inner margin, and apex of the mandibles, black. Thorax: a slightly impressed channel in front; the peduncle narrowed and rounded in front; the abdomen and legs rather paler than the head, the margins of the segments slightly constricted.

Worker (minor). About half the size, pale testaceous, and more abruptly truncated on the thorax.

Hab. Borneo (Sarawak).

Gen. TETRAPONERA, *Smith.*

1. Tetraponera atrata, *Smith, Ann. & Mag. Nat. Hist.* 2 ser. ix. p. 45 ♀.

Hab. Sarawak.

Subfam. MYRMICIDÆ.

Gen. MYRMICA, *Latr.*

1. MYRMICA LONGIPES. *M. fusco-pallida*, gracilescens; capite in column angustato; thorace compresso, metathorace bispinoso; pedibus elongatis; abdominis nodis duobus globosis.

Worker. Length $2\frac{1}{2}$ lines. Dark brown: the legs testaceous, the tarsi and tips of the antennæ pale testaceous; antennæ longer than the body, very slender, the scape, and also the flagellum, slightly thickened towards their apex; head much wider than the thorax, narrowed behind the eyes, and prolonged into a short neck; the mandibles rufo-testaceous. Thorax: the prothorax elongate, narrowed anteriorly into a short neck, slightly swollen posteriorly; the division between the meso- and meta-thorax deeply impressed; the metathorax with two short acute upright spines. Abdomen ovate, pedunculate, the peduncle formed of two nodes, the first smaller and less elevated than the second, each having a short footstalk.

Hab. Singapore. Borneo.

Notwithstanding the remarkable form of this species, its long slender antennæ and legs, the prolongation of the prothorax into a neck, &c., all of which appear to warrant the formation of a new genus for its reception, yet, not being acquainted with either of the perfect sexes, I do not feel justified in removing it from the genus *Myrmica*.

2. *MYRMICA PELLUCIDA*. *M. fusco-testacea*; *antennis pedibusque pallide testaceis, abdomine pellucido*.

Worker. Length $1\frac{1}{4}$ line. Head and thorax dark fusco-testaceous; antennæ and legs pale testaceous, nearly white; the divisions of the thorax distinctly marked, that between the meso- and meta-thorax rather deeply impressed; the abdomen of a transparent pale testaceous colour; the metathorax not spined.

Hab. Singapore.

Mr. Wallace, on a ticket attached to specimens of this insect, says, "House-ant: transparent abdomen: very active, but not destructive."

3. *MYRMICA VASTATOR*. *M. pallide flavo-testacea, lævis*; *abdomine nitido, apice fuscescenti*.

Worker. Length $1\frac{1}{4}$ line. The head, thorax, antennæ, legs, and petiole of the abdomen, pale yellow-testaceous; the head oblong quadrate; the eyes small, placed forwards on the side of the head; antennæ clavate, the club formed of three joints; the thorax deeply strangulated between the meso- and meta-thorax; the latter without spines; the abdomen pale at its base, fuscous at its apex.

Hab. Singapore.

Mr. Wallace attaches a ticket to this species, "House-ant: very destructive."

4. *MYRMICA AGILIS*. *M. pallide ferruginea*; *abdomine nigro, basi pallido, lævissimo et politissimo*.

Worker. Length 1 line. Head, antennæ, thorax and legs pale rufo-testaceous; head and thorax very smooth and shining; the flagellum clavate, the club consisting of three joints, the basal joint of the flagellum as long as the three following. Thorax swollen anteriorly, the metathorax with two minute spines. Abdomen ovate, the first node of the peduncle elongate, the second subglobose.

Hab. Malacca.

GEN. *HEPTACONDYLUS*, *Smith*.

Head suborbiculate, wider than the thorax; *eyes* lateral and ovate; *stemmata* placed in a triangle on the vertex; *antennæ* geniculated, filiform, the scape nearly as long as the flagellum, placed forwards on the head at the base of the clypeus; the *flagellum* 6-jointed, the joints clavate, except the apical one, which is cylindrical; the *labial palpi* 3-jointed; the *maxillary palpi* 3-jointed. *Thorax* ovate, gibbous; the *scutellum* very prominent; the *metathorax* armed with two acute spines (in the females), compressed and strangulated (in the workers). The *superior wings* with one marginal and one complete submarginal cell, the submarginal cell receiving the recurrent nervure; the superior angle of the discoidal cell touching the costal nervure. *Abdomen* ovate; the *peduncle* consisting of two nodes.

This is perhaps the most remarkable genus hitherto characterized amongst the *Formicidæ*; it presents one of those anomalies which perplex the naturalist. In the aculeate division of the Hymenoptera, we have felt that there existed in every species certain undeviating and tangible characters, whereby the sex at least might always be discriminated; namely, an additional segment to the abdomen, whereby to distinguish the males, as well as an additional joint to the antennæ; the number of joints in the male being thirteen, and twelve in the female. It is true that one or two exceptions have been recorded: thus, the male of *Crabro vagus*, amongst the fossorial group, has only twelve perceptible joints to the antennæ; and amongst the *Apidæ*, the males of the genus *Caelioxys* have apparently only six segments in the abdomen; in the latter case, however, a seventh segment is concealed, or retracted, within the sixth segment; and in all probability, in the fossorial insect, a joint is concealed within the apex of the scape. In the present genus we find, however, so wide a departure from the normal condition, that it stands almost alone, as an exception to the general rule. In the 'Transactions of the Entomological Society,' vol. ii. of the 2nd series, I established a genus (*Orectognathus*) on characters exhibited in a neuter Ant, the insect having only five joints in the antennæ; but as a neuter cannot be fairly considered the perfect condition of a species, I have thought it possible that the discovery of the other sexes might prove that I had been premature in establishing a genus on the imperfect condition of the species. This cannot be urged in the present instance, as both the female and worker are described, and neither of them has more than six joints in the flagellum.

1. *HEPTACONDYLUS ARACHNOIDES*. *H. capite thoraceque lævissimis nitidis rufo-testaceis ferrugineo-subnubulosis; abdomine obscure rufo-piceo nitido; pedibus elongatis gracilibus pubescentibus.*

Female. Length $4\frac{1}{2}$ lines. Head and thorax rufo-piceous, with dark ferruginous stains on the vertex, scutellum, and metathorax posteriorly; also two longitudinal lines of the same colour on the disk of the mesothorax; the abdomen very dark rufo-piceous, with the three apical segments pale rufo-testaceous; the entire insect very smooth and shining. The mandibles produced, with three black teeth at the apex, and one on the inner margin towards the apex; the antennæ pubescent; the thorax with scattered pale pubescence; the wings flavo-hyaline, the nervures pale testaceous; the legs elongate, with the apex of the joints and the tarsi pale rufo-testaceous; thickly covered with erect pale pubescence. Abdomen covered with pale

pubescence, the nodes of the abdomen dark rufo-piceous, globose, and each having a distinct petiole; the petioles pale rufo-testaceous.

Worker. Length $2\frac{3}{4}$ lines. Dark rufo-fuscons: the antennæ, head beneath, mandibles and lower part of the face pale rufo-testaceous; antennæ slender and elongate; head smooth and shining, not carinated. Thorax shining, the lateral margins traversed by a sharp carina; the metathorax elevated and armed with two acute spines; the legs elongate and slender, the coxæ beneath, the base and apex of the femora and tibiæ, and the tarsi, pale ferruginous. Abdomen smooth and shining, the apex pale ferruginous.

Hab. Borneo (Sarawak).

2. *HEPTACONDYLUS SUBCARINATUS.* *H.* capite thoraceque ferrugineis; abdomine rufo-fusco; capite thoraceque carinulis irregularibus abbreviatis; metathorace spinis duabus acutis armato.

Worker. Length $2\frac{1}{2}$ lines. Head, antennæ, thorax and legs, ferruginous, sometimes pale ferruginous; abdomen fuscons, or rufo-fuscons, the petiole of the basal node pale; head shining, and having a number of irregular delicate carinæ on the front and vertex; in front of the eyes are a number of irregular striæ. Thorax: the sides compressed, widest anteriorly; the superior surface slightly convex, and having a number of longitudinal abbreviated elevated carinæ; the lateral margins traversed by a slight carina; the metathorax with two stout acute spines. Abdomen smooth and shining; the insect sprinkled with a number of pale erect hairs, most numerous on the scape and legs.

Hab. Borneo (Sarawak).

3. *HEPTACONDYLUS CARINATUS.* *H.* obscure fusco-ferrugineus; capite thoraceque carinis irregularibus abbreviatis; metathorace spinis duabus longis armato.

Worker. Length $2\frac{1}{2}$ lines. Dark fusco-ferruginous, closely resembling *H. subcarinatus*, but with thicker antennæ, and the joints shorter, the scape distinctly shorter and not so slender at the base; the head proportionably larger and much more strongly carinated; the thorax roughly carinated, and having longer and stouter spines; in other respects agreeing with *H. subcarinatus*.

Hab. Borneo (Sarawak).

This may possibly be a form of *H. subcarinatus*, but the various differences pointed out appear to characterize a distinct species.

The insect which I am about to describe, although evidently belonging to the *Poneridæ*, is of such a different and remarkable form, to any insect belonging to any of the sections of the genus *Ponera*, or any of the subgenera, that I propose to constitute a new genus for its reception; the abdomen of this singular species

is formed, as it were, of three nodes, each being a little longer and wider than the preceding.

Gen. CERAPACHYS.

Body elongate; *head* narrowed before and behind the eyes; *eyes* ovate, lateral, placed about the middle of the head; *antennæ* short, incrassate; *mandibles* triangular, obsoletely toothed within. *Thorax* oblong-quadrate, strangled in the middle. *Abdomen*: oblong, with a deep strangulation between the first and second segments.

1. CERAPACHYS ANTENNATUS. *C. aterrimus*, nitidus; *antennis* brevibus, crassis; *thorace* oblongo-quadrate; *abdomine* elongato, nodo quadrate; *abdominis* segmentis primo et secundo incisura separatis.

Worker. Length $3\frac{1}{2}$ lines. Jet-black, smooth and shining; *antennæ* one-third longer than the head; the scape short and incrassate, clavate; the flagellum incrassate, the joints short and transverse, except the apical one, which is as long as the four preceding joints; the head depressed on each side in front of the eyes; the *antennæ* inserted at the anterior margin of the head, each at the side of an elevated carina; the *mandibles*, flagellum and apex of the scape obscurely ferruginous; the posterior margin of the vertex slightly emarginate its entire width, a few scattered minute punctures on the vertex, and a small fossulet in the middle between the eyes. *Thorax*: oblong-quadrate, with a few scattered punctures above, and a few short erect hairs; the tips of the femora and tarsi, and the apical joints of the latter, pale rufo-testaceous; the basal joint of the anterior tarsi bent; the calcaria white. *Abdomen* elongate; the peduncle quadrate, a little narrower than the first segment of the abdomen, which has the sides slightly rounded; a deep strangulation between the first and second segments; the apex obliquely truncated, the margins of the truncation finely denticulated.

Hab. Borneo (Sarawak).

2. CERAPACHYS OCULATUS. *C. pallide fuscus*; *oculis* magnis, atris; *antennis* pedibusque pallide testaceis; *alis* hyalinis; *petiolo* bi-articulato, binodi.

Male. Length $2\frac{1}{2}$ lines. Pale-brown, with dark stains on the sides of the thorax; head oblong-quadrate, the *mandibles* forming a triangular projection; the eyes large and prominent, situated anteriorly on the sides of the head; the ocelli large, placed in a dark stain on the vertex; the *mandibles*, *antennæ*, and legs, pale testaceous. The thorax oblong-ovate; the wings hyaline and iridescent, the nervures pale testaceous; the basal node of the petiole narrow at the base, widened to the middle, and again narrowed to the apex, the widest part with a sharp edge, or carina; the second node ovate;

the abdomen subovate, widest towards the extremity, the apex pointed.

It is quite possible that this may prove to be the male of *C. antennatus*, but I do not feel authorized in placing them together.

Gen. CREMATOGASTER, *Lund*.

1. CREMATOGASTER ANTHRACINUS. *C. aterrimus*, lævis et nitidus; tarsi rufo-piceis.

Worker. Length $1\frac{1}{4}$ line. Jet-black, smooth and shining; the face with a few delicate striæ; the extreme base of the scape, and the apex of the flagellum, pale testaceous. Thorax: flattened above, opaque and finely rugose; the metathorax armed on each side with an acute spine; the tarsi pale testaceous, with the claw-joint darker. Abdomen: heart-shaped, smooth, shining and impunctate.

Hab. Singapore.

2. CREMATOGASTER BRUNNEUS. *C. pallide castaneo-rufus*, lævis nitidusque; thorace spinis duabus acutis armato.

Worker. Length 2 lines. Reddish-brown, or castaneous, varying a little in colour; head smooth and shining, wider than the thorax, about the same width as the abdomen, slightly emarginate at the vertex, and more deeply coloured. Thorax: the disk concave and finely striated longitudinally; the metathorax deeply concave and furnished on each side with a stout acute spine; the legs, with the tips of the joints and the tarsi, pale testaceous. Abdomen: heart-shaped, smooth and shining; the first node heart-shaped, flattened above; the second node globose, with two tubercles above.

Worker minor. About one-third smaller, and of a pale testaceous colour; the abdomen darker at the apex.

Hab. Borneo (Sarawak).

3. CREMATOGASTER CEPHALOTES. *C. testaceus*; capite thorace duplo latiore; spinis metathoracis brevibus et acutis.

Worker. Length $1-1\frac{1}{4}$ line. Testaceous; head very large, smooth and shining; the antennæ, clypeus and mandibles, pale testaceous. Thorax: rounded anteriorly, deeply constricted in the middle; in front rugose, with a smooth shining space before the constriction; the metathorax deeply excavated, produced laterally into an acute spine on each side; the tibiae and tarsi pale testaceous. Abdomen heart-shaped; the basal node flattened anteriorly, with the sides angulated; the second node globose.

Worker minor. Differs in having the head proportionably smaller, and the thorax smooth and shining above.

Hab. Borneo (Sarawak).

4. *CREMATOGASTER OBSCURUS*. *C. testaceus*, lævis et nitidus; thorace strangulato; metathorace bispinoso.

Worker. Length $1\frac{1}{4}$ line. Dull testaceous; the base of the scape and of the flagellum, the clypeus and mandibles, pale; the head smooth and shining. Thorax: rounded in front, with a central longitudinal channel; deeply strangled in the middle; the metathorax somewhat quadrate, with the posterior lateral angles produced into short spines; the legs with the apex of the joints, and the tarsi, pale testaceous. Abdomen heart-shaped; the basal node of the peduncle flattened in front, the narrow end above.

Hab. Borneo (Sarawak).

5. *CREMATOGASTER INFLATUS*. *C. niger*, lævis et nitidus; parte postica thoracis pallide testacea, inflata.

Worker. Length $2\frac{1}{2}$ lines. Black, smooth and shining; the antennæ dark rufo-piceous; the mandibles striated and ferruginous, their teeth black; eyes small and lateral, placed about the middle of the head. Thorax: the anterior margin rounded; the posterior portion inflated into a yellowish semi-transparent bladder-like swelling, divided in the middle by a deep longitudinal depression; the swollen part not quite so wide as the head; the apical joints of the tarsi rufo-testaceous. Abdomen heart-shaped; the peduncle, base, and the apical margin of the first segment, obscurely rufo-piceous.

Hab. Singapore; Borneo (Sarawak).

This is one of those singular and anomalous species, which, without any particle of information, derived from observation, puzzle and perplex the naturalist; what can possibly be the use of the bladder-like excrescence on the thorax of this insect, it is difficult to imagine; to the touch it is elastic, and apparently forms a receptacle for saccharine fluids. With the aid of a microscope, a small circular orifice can be seen at each of the posterior lateral angles of the swollen part, and small crystallized particles are apparent, not only within the orifice, but scattered over the surface of the inflation; we may, therefore, reasonably suppose that this singular apparatus is for the purpose of elaborating a suitable and necessary aliment for the larvæ of this singular insect.

6. *CREMATOGASTER DIFFORMIS*. *C. niger*; capite thorace multum latiore; thorace dilatato et postice profunde excavato; abdomine cordato.

Worker. Length $2\frac{1}{4}$ lines. Black; head very large, twice as wide as the thorax; the tips of the mandibles, and apical joints of the flagellum, dark ferruginous; the head smooth and shining; the eyes small, placed laterally about the middle of the head. Thorax: the anterior margin rounded, the sides parallel behind; the metathorax greatly dilated at the sides and above, and with a deep excavation behind;

the legs stout, with their joints and the tarsi ferruginous. Abdomen heart-shaped, with the base, in some examples, slightly ferruginous.

Worker minor. Differs only in being one-third smaller.

Hab. Singapore; Borneo (Sarawak).

This species resembles the *C. inflatus* in form; but the swollen portion of the thorax is of a solid consistency; it forms, however, a similar laboratory of saccharine matter; the orifice from which it exudes is not exactly at the posterior angles, but a little way beneath; in some specimens, masses of crystallized particles can be seen beneath the orifice; of this species, both large and small workers have been examined, and the same apparatus is found on them both.

Gen. ATTA, Latr.

1. ATTA PENETRANS. *A.* capite thoraceque nigris; abdomine obscure rufo-piceo; alis subhyalinis; capite thoraceque longitudinaliter striatis.

Female. Length 4 lines. Black and shining; head longitudinally finely striated; the mouth, clypeus and antennæ, ferruginous. Thorax: elongate-ovate, the prothorax anteriorly and the legs, ferruginous; the thorax above with oblong punctures which run into striæ; an impunctate line in the middle of the mesothorax anteriorly; the metathorax truncated, the truncation smooth and shining; wings subhyaline, with a fuscous line along the costal nervure; the apical margins of the wing with a fringe of very fine white hairs. Abdomen: elongate-ovate, dark rufo-piceous, the apical margins of the segments brighter; the nodes of the peduncle globose and punctured.

Hab. Borneo (Sarawak).

2. ATTA CINGULATA. *A.* ferruginea; pedibus abdomineque pallide ferrugineis; capite maximo, thorace triplo latiore.

Worker major. Length $1\frac{3}{4}$ line. Head very large, ferruginous, the antennæ paler; eyes very small, placed at the sides of the head a little before the middle. Thorax: pale ferruginous, very convex or globose anteriorly, much narrower behind, with two short acute spines on the metathorax; legs pale rufo-testaceous. Abdomen: ovate, with the base truncated, with a fuscous ring in the middle; the nodes of the peduncle globose.

Worker minor. About 1 line in length. The head much smaller and more elongate; in colour, resembling the larger worker, and equally smooth and shining; the abdomen with a fuscous ring in the middle.

Hab. Borneo (Sarawak).

Gen. PHYSATTA.

Head small; *eyes* of moderate size, placed a little before the middle; *ocelli* in a triangle on the vertex; *mandibles* stout and denticulate

at the apex; *antennæ* short, not so long as the head and thorax; the *scape* nearly as long as the flagellum, slightly thickened at the apex; *flagellum* subclavate, 6-jointed, the first joint shorter than the second; the third, fourth and fifth about the same length as the first, the apical joint the length of the two basal ones. *Maxillary palpi* 3-jointed, the basal and apical joints of about equal length, the intermediate joint twice the length of the apical joint, the latter obliquely truncate at the apex. *Labial palpi* 3-jointed, the two basal joints clavate, the apical one fusiform. *Thorax* subglobose; *anterior wings* with one marginal and two submarginal cells, the first submarginal cell about the length of the stigma, the second extending to the apex of the wing; with one sub-triangular discoidal cell; the *tibia* armed with a single spur at the apex. *Abdomen* globose, pedunculated, the peduncle formed of two nodes.

This genus in one of its most prominent characters agrees with the genus *Heptacondylus*, both having seven-jointed antennæ: their relative proportions are, however, very different, as well as that of the joints of the flagellum; the wings have also a different venation; this latter character will, I am inclined to believe, prove eventually that by which the generic divisions of the Hymenoptera must be regulated; even at present, with our meagre and imperfect knowledge of the species, it does, if strictly adhered to, bring together assemblages of species, allied alike in habit and structure; when taken in connexion with the structure of the mandibles and legs, indicative of habit, it becomes perhaps the most safe and available character hitherto adopted for their generic subdivision; the greatest help to science I think is its simplification.

1. *PHYSATTA DROMEDARIUS*. *P.* capite thoraceque ferrugineis; alis abdomineque nigris.

Female. Length $6\frac{1}{2}$ lines. The head, thorax, legs and petiole of the abdomen ferruginous; the mandibles with four or five black teeth; the head and thorax longitudinally striated and clothed, as well as the legs, with erect thin fulvous pubescence; the intermediate and posterior legs dark rufo-piceous; wings dark fuscous, slightly iridescent; the metathorax armed with two short stout spines at its base, the truncated portion transversely striated. Abdomen black, covered with a short erect fuscous pubescence; the nodes of the petiole subglobose, the first attached to the thorax by a short stout petiole.

Hab. Borneo (Sarawak).

Gen. TYPHLATA.

Mandibles triangular; *eyes* obsolete; *flagellum* 9-jointed; petiole of the abdomen formed of 2 nodes.

The above characters are those of the worker of the species; probably an examination of the other sexes would present other very distinctive generic characters, particularly in the neurulation of the wings: the palpi I have not examined.

1. TYPHLATA LÆVICEPS. *T. niger*, nitidus; capite, thorace antice et abdomine glaberrimis; antennis tarsisque rufo-piceis.

Worker. Length 2 lines. Black; the head glassy-smooth and shining; ovate, with the posterior margin of the vertex truncate; in some examples, an indistinct castaneous spot at the sides of the head, in the usual situation of the eyes; the antennæ ferruginous. Thorax elongate, compressed at the sides; very smooth and shining anteriorly, with a delicate striation in the middle, the metathorax being finely rugulose; the tarsi rufo-piceous. Abdomen: ovate, very smooth and shining; the nodes subglobose, the basal one being the smallest.

Hab. Borneo (Sarawak).

Subfam. CRYPTOCERIDÆ.

Gen. ECHINOPLA.

Head transverse; *eyes* small, placed laterally, high on the head; antennæ 12-jointed, inserted forwards on the head, wide apart; the *labial palpi* 4-jointed, the three basal ones of about equal length, clavate; the apical joint as long as the two preceding joints united; the *maxillary palpi* 5-jointed, elongate, the three apical joints long and slender, the two basal ones much shorter and stouter; *mandibles* short, stout, and of equal width throughout, armed with five stout teeth. *Thorax* oblong-quadrate; legs of moderate length; tarsi 5-jointed; each tibia armed with a single spine at the apex. *Abdomen* globose; peduncle formed of a single node; the first segment very large, concealing the other segments beneath it.

1. ECHINOPLA MELANARCTOS. *E. nigra*, hispida; oculis extantibus; abdominis squama in utroque latere spina longa acuta horizontali; abdomine globoso.

Worker. Length 3 lines. Black; the head, thorax and abdomen, covered with short blunt spines, or pedestals, each having a long hair at its summit; the palpi pale testaceous; the antennæ inserted under thin elevated curved plates on the anterior part of the face, the face with a rugose striation; the head smooth beneath, shining and concave; the eyes very prominent and globose. Thorax rugose; the legs slightly pubescent, the calcarea pale testaceous. (Fig. and details, Plate I.)

Hab. Singapore.

2. *ECHINOPLA PALLIPES*. *E. nigra*, hispida; oculis prominentibus; abdomine globoso; squama in utroque latere spina horizontali; pedibus pallide testaceis.

Worker. Length $2\frac{1}{2}$ lines. Black, rugose; the abdomen vermiculate, interspersed with slight elevations placed in great regularity over the entire upper surface, each elevation terminating in a hair; the scape and the mandibles ferruginous; the eyes very prominent; the palpi and legs pale testaceous, with the tarsi rufo-piceous; the peduncle transverse, produced on each side into a short horizontal spine; the abdomen rufo-piceous.

Hab. Borneo (Sarawak).

It is very difficult to describe the sculpturing of this insect; on the head it is strongest; the species strongly resembles *E. melanuretos*, but the elevations are shorter, as well as the hairs at their apex.

3. *ECHINOPLA STRIATA*. *E. nigra*; capite, thorace et abdomine longitudinaliter striatis; thorace oblongo, subquadrato; pedunculo transverso.

Worker. Length 3 lines. Black; the head, thorax and abdomen finely striated longitudinally; the head with an obscure blue tinge; the palpi pale rufo-testaceous. Thorax: oblong, the margins denticulate, the anterior margin rounded, the lateral margins narrowed to the middle, and again widened posteriorly; above slightly arched; the division of the pro- and meso-thorax distinctly marked by a suture; that of the meso- and meta-thorax by a deep strangulation; the peduncle of the abdomen incrassate, transverse, and armed on each side by a stout spine. The entire insect thinly sprinkled with erect black hairs.

Hab. Malacca.

Of this species I have only seen two individuals: I place it in this genus with some hesitation; but the antennæ are similar; the thorax and scale of the abdomen of the same form; the legs also are short, as in *Echinopla*: the principal difference being, that the eyes are less prominent; it is altogether a very curious and remarkable species.

GEN. CATAULACUS, *Smith*.

1. *CATAULACUS INSULARIS*. *C. niger*; vertice spinis duabus postice armato; alis flavo-hyalinis; metathorace hispinoso; abdomine cordato.

Male. Length 3 lines. Black: head and thorax rugose; the antennæ, the eyes, the mandibles, the tibiæ and the tarsi, ferruginous; the palpi pale; the eyes very large and prominent; the clypeus produced and broadly truncate in front; the hinder margin of the vertex straight, margined, and having the posterior lateral angles produced into stout acute spines; the outer margins of the spines serrated; beneath are smaller spines at the lower lateral angles; the wings sub-

hyaline and yellowish; the nervures scarcely discernible; the hinder margin of the metathorax slightly emarginate its entire width, with an acute spine at each of the lateral angles. The nodes of the abdomen rugose; the first node oblong-quadrate; the second nearly quadrate; the abdomen reddish at the base, and, as well as the nodes, thinly sprinkled with erect whitish hairs.

Hab. Borneo (Sarawak).

2. *CATAULACUS HORRIDUS*. *C. niger*; capitis angulis posticis spinosis; marginibus capitis crenulatis; thorace aspere sculpto, spinis duabus aentis elongatis postice armato; abdomine ovato, basi striato.

Worker. Length 3 lines. Black; the antennæ short, thick and clavate; the apex rufo-testaceous; head reticulated, produced before the eyes and widely truncated, the lateral angles of the truncation rounded; the lateral margins with a short spine before the eyes; the vertex with the posterior margin emarginate its entire width, forming at the lateral angles large acute spines. Thorax: ruggedly sculptured on the disk, narrowed to the apex of the mesothorax, which is separated from the hinder portion by a deep transverse incision; produced posteriorly at the angles into long, stout, acute spines; the nodes of the abdomen rugose; abdomen rounded, emarginate and striated at the base; the entire insect sprinkled with short erect white setæ.

Hab. Borneo (Sarawak). Malacca.

3. *CATAULACUS RETICULATUS*. *C. niger*, delicatule reticulatus, præsertim in abdomine; marginibus capitis thoracisque lateribus crenulatis; thorace spinis duabus validis postice armato.

Worker. Length $1\frac{1}{2}$ –2 lines. Black; head and thorax reticulated; antennæ short, thick and clavate; the clypeus widely emarginate; the sides of the head produced into a sharp angle in front of the eyes; behind the eyes the margin is crenulated, the posterior lateral angles acute. Thorax: the anterior margin slightly rounded; the sides rounded and narrow to the metathorax, with a short tooth anteriorly and posteriorly; the thorax produced behind into two elongate, lateral, acute spines; the anterior tibiæ and tarsi and the apical joints of the intermediate and posterior tarsi, ferruginous. Abdomen: oval, margined, emarginate in front and very delicately reticulate.

Var. *a. minor*. The scape, apical joint of the flagellum, the margin of the head before the eyes and the legs, ferruginous.

Hab. Borneo (Sarawak).

This species somewhat resembles the *C. Taprobana*, but is different in sculpture and form.

Gen. MERANOPLUS, *Smith*.

1. *MERANOPLUS CASTANEUS*. *M. castaneo-rufus*; capite thoraceque subrugosis; metathorace bispinoso; pedunculi nodo secundo spina postice armato.

Female. Length $3\frac{3}{4}$ lines. Chestnut-red; the flagellum obscurely red; the teeth of the mandibles and the eyes black; the head and thorax above longitudinally strigose, the head more finely so, both sparingly covered with scattered erect fine pale hairs; the scutellum rugose; the metathorax with a stout acute short spine on each side at its base; the central portion of the truncation shining and finely striated longitudinally; the legs with scattered pale hairs, the femora dark red towards their base. The nodes of the peduncle of the abdomen rugose; the first, viewed laterally, wedge-shaped; the second subquadrate, the posterior margin produced into an acute spine; the second node is produced into an angular tooth or process at its base, and both are sprinkled with long erect hairs. Abdomen ovate, finely punctured, and thinly sprinkled with long pale hairs, most thickly covered towards the apex.

Hab. Borneo (Sarawak).

2. *MERANOPLUS CORDATUS.* *M.* castaneo-rufus; thorace quadrispinoso; abdomine cordato.

Worker. Length 2 lines. Chestnut-red; the head and thorax palest; the head very delicately reticulated; the eyes small and black, placed at the sides of the head backwards near the vertex; the clypeus widely truncate in front. Thorax: punctured, the anterior margin somewhat transverse, slightly produced and rounded in the middle, the lateral angles acute; the sides rounded and narrowed to the base of the metathorax; the posterior margin transverse; at the angles are long acute spines, with a second shorter spine before them; the truncated vertical portion of the metathorax has on each side about the middle of the lateral margins a short acute spine. Abdomen: the first node, viewed laterally, is wedge-shaped, the second somewhat quadrate, its posterior margin above produced into an acute spine; the upper margin of the first node, truncate; the abdomen heart-shaped, acute at the apex; the entire insect sprinkled with erect pale hairs.

Hab. Borneo (Sarawak).

This is probably the worker of *M. castaneus*.

3. *MERANOPLUS MUCRONATUS.* *M.* capite, thorace pedibusque ferrugineis; abdomine nigro; thorace quadrato; angulis singulis spina acuta armatis.

Worker. Length $2\frac{1}{2}$ lines. The head and thorax ferruginous; the abdomen black; the head coarsely rugose, narrowed before the eyes and widely emarginate in front; the eyes prominent, behind them the margins are widened slightly to half the distance between them and the posterior angles of the head, towards which the margins are narrowed; the head sprinkled with a few long erect reddish hairs. Thorax: quadrate, rugose, with the angles produced into four very long, stout, acute spines; the hinder margin with two short blunt teeth or spines in the middle, with two minute ones beyond them placed some-

what obliquely; the metathorax with two long, rather slender, very acute spines; the thorax and legs thinly sprinkled with very long ferruginous hairs; the abdomen sprinkled with long erect ferruginous hairs, the nodes rugose.

Var. *a*. The femora rufo-fuscous.

Hab. Malacca (Mount Ophir).

To this species Mr. Wallace attached a ticket, upon which he had written "House Ant:" but I have not obtained any further information.

Fam. MUTILLIDÆ.

Gen. MUTILLA, *Linn.*

1. *Mutilla blanda*, *Smith, Cat. Hym.* pt. iii. p. 32.

Hab. Malacca (Mount Ophir). India.

2. *Mutilla representans*, *Smith, Cat. Hym.* iii. p. 35.

Hab. Borneo (Sarawak). Malacca. India.

3. *MUTILLA DEIDAMIA*. *M. nigra*; scapo, mandibulis, thorace, pedibus abdominisque segmento basali rubris.

Female. Length 3-4 lines. Head black; the scape, palpi and mandibles, ferruginous, tips of the latter black; the flagellum ferruginous towards the apex beneath. Thorax: elongate-quadrate, slightly widened behind, above rugose, the lateral margins crenulated; sprinkled with reddish-brown pubescence; the legs ferruginous, thinly sprinkled with a mixture of reddish and of glittering white hairs. Abdomen: black, the basal segment red; three ovate spots of silvery white pubescence placed transversely towards the base of the second segment, and a broad fascia of the same at the base of the third segment; at the base, apex and beneath, a scattered glittering white pubescence.

Hab. Borneo (Sarawak).

4. *MUTILLA URANIA*. *M. capite thoraceque sanguineis; abdomine nigro, basi segmenti secundi macula ovata, fasciæque segmenti tertii, flavescenti-albis.*

Female. Length $6\frac{1}{2}$ lines. Head and thorax blood-red and coarsely rugose; the mandibles and antennæ black; the flagellum obscurely red beneath. Thorax: the legs black and covered with glittering yellowish-white pubescence. Abdomen: longitudinally rugose, a reversed heart-shaped spot at the base of the second segment, and the third covered with yellowish-white pubescence; a triangular black spot at the base of the third segment in the middle; beneath, the segments are fringed with long pale hairs; the apical margins of the segments of the abdomen with a sooty-black pubescence.

Male. Length 5-5½ lines. This sex has the head nearly, or quite black;

the eyes slightly reniform. Thorax red; the wings dark brown with a purple iridescence, pale towards their base. Abdomen black, smooth and shining, much narrowed at the base, and subpetiolate; the second and two following segments fringed with long white pubescence; the three apical segments fringed with black.

Hab. Borneo (Sarawak).

5. *MUTILLA SUSPICIOSA*. *M. nigra*, pubescens; alis fuscis; abdominis segmentis secundo tertioque rubris.

Male. Length 4-7 lines. Black; the eyes slightly emarginate; the head covered with a thin silvery-white pubescence, most sparing on the vertex, which is shining and coarsely punctured. Thorax covered with a silvery pubescence, densely so on the metathorax; the disk of the mesothorax shining, with elongate punctures which run into striæ; in the middle are three elongate carinæ; the tegulæ large and shining-black; the wings dark fuscous, with a purple iridescence. Abdomen finely punctured; the apical margin of the basal segment, and the second and third segments, red; sprinkled with long glittering silvery-white hairs.

Hab. Borneo (Sarawak).

This species very closely resembles the *M. fuscopennis*: but I think it is sufficiently distinct.

6. *MUTILLA GRACILLIMA*. *M. capite abdomineque nigris*; thorace rubro; alis obscure fuscis.

Male. Length 4 lines. Head and abdomen black, the thorax bright red; head shining, with longitudinal furrows, and a deep channel before the anterior stemma; the scape, and first joint of the flagellum, ferruginous; the pro- and meso-thorax rugose; the metathorax with large separated punctures; the wings fuscous, subhyaline at their base; the anterior tibiæ and femora, and the intermediate femora, ferruginous; the calcaria white. Abdomen: the two basal segments with purple and blue tints; the apical margin of the second segment, and the third segment, with a broad band of silvery-white pubescence; the following segments fringed with black pubescence.

Hab. Borneo (Sarawak).

7. *MUTILLA FAMILIARIS*. *M. capite abdomineque nigris*; thorace rubro; abdominis basi subito truncato; abdominis segmenti secundi basi macula, tertii fascia lata argenteo-pubescentibus.

Female. Length $4\frac{3}{4}$ lines. Head and abdomen black, the former rugose; the flagellum ferruginous beneath. Thorax ferruginous and oblong-quadrate; the disk rugose; the margins crenulated. Abdomen with elongate confluent punctures; the basal segment abruptly truncated; the second segment with a small ovate spot in the middle of its base, and the third segment covered with short silvery-white pubescence;

beneath, the margins of the segments are fringed with long white pubescence.

Hab. Singapore.

Although this species bears a very close resemblance to several which have been described, it is very distinct, and may be readily distinguished by the abrupt truncation of the basal abdominal segment.

8. *MUTILLA CALLIOPE.* *M.* capite nigro; thorace rubro; abdomine cyaneo, fasciâ lata argenteo-pubescenti decorato.

Female. Length 3-3½ lines. Head black, punctured, the punctures running into longitudinal striæ; the base of the scape, and the tips of the mandibles, ferruginous. Thorax bright ferruginous, elongate-quadrate and coarsely rugose; the posterior angles rounded; the anterior tibiæ and tarsi, and the base of the intermediate and posterior femora, ferruginous; the legs with a scattered silvery pubescence, that on the thorax above, ferruginous; the thorax slightly carinated at the sides. Abdomen dark blue; the apical margin of the second segment, and the base of the third, with united fasciæ of bright silvery pubescence; the sides and apex of the abdomen with scattered silvery hairs.

Male. Resembles the female in colour, but has the legs entirely black; with the apical margin of the second abdominal segment, pale testaceous; the wings dark brown; the eyes large and ovate.

Hab. Borneo (Sarawak).

9. *MUTILLA PROSERPINA.* *M.* capite abdomineque nigris; thorace pedibusque rubris; abdominis segmenti secundi basi maculis duabus ovatis, tertii fasciâque argenteo-pubescentibus.

Female. Length 2-3 lines. Head black; the scape, mandibles and palpi, ferruginous. Thorax ferruginous, oblong, rounded in front and behind; rather finely rugose, sprinkled with reddish-brown pubescence, the margins crenulated; the legs ferruginous, with the knees and tarsi slightly fuscous. Abdomen: the extreme base ferruginous; the second segment with two ovate spots, and the third with a fascia of silvery-white pubescence; beneath, and towards the apex above, thinly sprinkled with long glittering white hairs.

Hab. Borneo (Sarawak).

10. *MUTILLA PANDORA.* *M.* capite abdomineque nigris; thorace rubro; abdominis segmento secundo maculis tribus ovatis, tertio fasciâ argenteo-pubescenti ornatis.

Female. Length 5 lines. Head black; the scape, flagellum beneath, except the basal segment, the palpi, and basal half of the mandibles, ferruginous; the head coarsely and closely punctured, with scattered erect black hairs above, and with silvery white ones beneath. Thorax and legs bright ferruginous, the former oblong-quadrate, coarsely rugose, the lateral margins crenulated; sprinkled with reddish

pubescence. Abdomen black, the base ferruginous; covered with short black pubescence; three ovate spots at the base of the second segment, a narrow fascia on its apical margin, and a broad one on that of the following segment, of silvery-white pubescence; beneath, shining and punctured, the margins of the segments rufo-piceous and fringed with glittering pale hairs.

Hab. Borneo (Sarawak).

11. *MUTILLA SIBYLLA*. *M. capite abdomineque nigris; thorace rubro; abdominis segmenti secundi basi maculis duabus ovatis, fasciaque segmenti tertii albo-pubescentibus.*

Female. Length 4-6 lines. Black; the thorax red; a tubercle at the insertion of each antenna, and the middle of the mandibles, ferruginous; the vertex with scattered long erect reddish brown hairs; on the clypeus, mouth and cheeks are some long glittering silvery-white hairs; the palpi elongate. Thorax: oblong-quadrate, the anterior margin slightly rounded; the legs with scattered glittering white hairs; the legs black, with the tarsi obscurely rufo-piceous; the calcaria pale testaceous. Abdomen: two small ovate spots at the base of the second segment, and a broad fascia on the apical margin of the third, of dense, short, silvery-white pubescence; beneath, the segments shining, and the second with scattered large deep punctures; the apex of the abdomen with long white pubescence.

Hab. Borneo (Sarawak).

12. *MUTILLA CASSIOPE*. *M. capite abdomineque nigris; thorace pedibusque rubris; tibiis tarsisque fuscis; abdominis basi truncata.*

Female. Length 3 lines. Head and abdomen black, the former closely and strongly punctured; the mandibles, palpi and antennæ beneath, ferruginous; the scape rufo-piceous. Thorax ferruginous; the anterior margin transverse; slightly and evenly narrowed to the apex of the metathorax; the lateral margins crenulated; the disc coarsely rugose; the coxæ and femora ferruginous; the tibiæ and tarsi fuscous. Abdomen: the base abruptly truncate; covered with elongate punctures; the apical margin of the third segment with a fascia of snow-white pubescence; sprinkled over with long silvery-white hairs.

Hab. Borneo (Sarawak).

13. *MUTILLA DARDANUS*. *M. capite abdomineque nigris; thorace pedeque antico rubris; alis fuscis; abdominis segmentis primo, secundo tertioque pube alba fasciatis.*

Male. Length 6 lines. Head and abdomen black; the thorax red; the eyes emarginate; the antennæ incrassate at the base, tapering to the apex; a deep longitudinal furrow runs from the insertion of the antennæ to the posterior margin of the vertex, on each side of which is a similar furrow which terminates before the insertion of the antennæ; the ocelli distinct on the vertex. Thorax: the anterior legs

ferruginous; wings brown, and iridescent. Abdomen shining, punctured, and having purple and blue tints in different lights; a narrow fascia on the apical margin of the first segment and a broader one on the second and third, of snow-white short dense pubescence; the margins of the apical segments fringed with long black pubescence.

Hab. Borneo (Sarawak).

14. *MUTILLA UNIMACULATA*. *M.* capite abdomineque nigris; thorace ferrugineo; abdominis segmenti secundi basi macula ovata, segmento tertio fascia lata alba pubescente.

Female. Length 6 lines. Black; the thorax ferruginous, and coarsely rugose. Head sprinkled with dark brown hairs, eyes large and ovate; the clypeus and scape with whitish hairs. Thorax oblong-quadrate, slightly narrowed posteriorly; the disk with short reddish-brown pubescence at the sides; beneath and on the legs it is of a glittering silvery-white; the metathorax with long thin pale pubescence; an ovate spot at the base of the second segment, and the third segment clothed with dense short white pubescence, in the middle at its base, a triangular black shape; beneath, the apical margins of the second, third and fourth segments with white marginal pubescent fasciæ.

Hab. Borneo (Sarawak).

Gen. MYRMOSIDA, *Smith*.

Head subquadrate; *stemmata* in a triangle on the vertex; *eyes* large, round and lateral; *antennæ* subfiliform, inserted at the base of the clypeus, not closely approximating; the *clypeus* triangular; *mandibles* triangular. *Thorax*: longitudinally quadrangular, the sides slightly rounded; the posterior margin of the prothorax curving backwards to the origin of the wings; the tegulæ small; the superior wings with one marginal and two submarginal cells; the first submarginal receiving the first recurrent nervure. *Abdomen*: ovate, the two basal segments forming distinct nodes, the first subquadrate, the second node widening towards the apex and again narrowing at one fourth from the apex.

The insect from which the above characters are drawn being a male, there can be little doubt that when the other sex is discovered the generic characters will require a complete revision; in the neururation of the wings this genus very closely approaches that of *Mutilla*, the males of which have the third submarginal cell frequently obliterated, and the form of the abdomen often very eccentric; the form of the eyes also varies, from being deeply emarginate or reniform, to being round and very prominent. The situation of the present genus I think must be next to *Myrmosa*:

we should certainly expect to find the female apterous, and the genus correctly placed in the family *Mutillidæ*.

1. MYRMOSIDA PARADONA. *M. nigra*; capite thoraceque rude rugosis; alis subhyalinis; abdomine basi binodoso.

Male. Length 4 lines. Black; head nearly as wide as the thorax, coarsely rugose, across the face between the eyes are some deep transverse grooves; the face with two longitudinal carinæ, outside of which the antennæ are inserted; the scape short and thick, the flagellum nearly of equal thickness throughout, pointed at the apex, the extreme tip pale testaceous; mandibles ferruginous at their apex; the palpi pale testaceous. Thorax: coarsely rugose; wings subhyaline, the nervures ferruginous, stigma dark brown; the anterior tarsi ferruginous, with a dense glittering pale pubescence beneath; the base of the femora, knees and apex of the tibiae and apical joints of the tarsi, ferruginous; the calcaria pale rufo-testaceous. The abdominal nodes coarsely longitudinally rugose; the abdomen smooth and shining, the second and following segments punctured, with their apical margins impunctate.

Hab. Singapore.

Only one specimen of this very singular insect has been captured, and is in the collection of W. W. Saunders, Esq.

Tribe FOSSORES, *Latr.*

Fam. SCOLIADÆ.

Gen. SCOLIA, *Fabr.*

Div. 1. *The anterior wings with two submarginal cells and one recurrent nervure.*

1. *Scolia erratica*, *Smith, Cat. Hym.* pt. 3. p. 88.

Scolia verticalis, *Burm. Abh. Nat. Ges. Halle*, p. 37.

Hab. Sarawak.

Div. 2. *The anterior wings with two submarginal cells and two recurrent nervures.*

2. *Scolia aureicollis*, *St. Farg. Hym.* iii. 499.

Hab. Singapore.

3. *Scolia grossa*, *Burm. Abh. Nat. Ges. Halle*, i. p. 23.

Hab. Sarawak.

This is *Tiphia grossa* of the 'Systema Piezatorum' of Fabricius.

4. *Scolia Iris*, *St. Farg. Hym.* iii. p. 547.

Hab. Malacca (Mount Ophir). Java. Sumatra. China (Shanghai).

Div. 3. *The anterior wings with three submarginal cells and one recurrent nervure.*

5. *Scolia patricialis*, *Burm. Abh. Nat. Ges. Halle*, i. 19.

Hab. Malacca. Sumatra.

6. *Scolia rubiginosa*, *Fabr. Syst. Piez.* p. 241.

Hab. Malacca. Java.

7. *SCOLIA CINCTA*, *Smith.* *S. nigra*; vertice flavo; alis nigris; abdomine fascia pubescente ferruginea.

Black; the head, from the insertion of the antennæ to the hinder margin of the vertex, yellow, glossy smooth. The thorax closely and strongly punctured; a smooth shining space in the middle of the disk, the scutellum also shining, with a few large scattered punctures; the wings brown-black with a splendid violet iridescence, rather paler towards their base with the nervures ferruginous; the metathorax truncated and slightly concave. Abdomen: closely but more finely punctured than the thorax, with a shining nearly impunctate space in the middle of each segment; the posterior margin of the second segment with a fringe of bright ferruginous pubescence, also a little ferruginous pubescence at the tip of the apical segment.

Female. *Hab.* Borneo (Sarawak). Length 13 lines.

This species is most closely allied to *S. patricialis*, but has the sculpture of the thorax very different and has no yellow markings on the scutellum, base and third segment of the abdomen, which distinguishes that species.

8. *Scolia procera*, *Fabr. Syst. Piez.* p. 241.

Hab. Sarawak. Java.

Nearly all the specimens of this fine species have been brought from Java. I believe it has occurred in India, but Borneo is probably the extent of its geographical range to the south.

9. *SCOLIA OPALINA*, *Smith.* *S. atra*; alis nigris; metathorace abdomineque opalino pulcherrime lavatis.

Black, with splendid prismatic colours reflected in certain lights; the head smooth and shining, and with a few scattered punctures; the scape of the antennæ smooth and shining, the flagellum opaque. Thorax: above shining, somewhat distantly but evenly punctured, a smooth space on the disk of the mesothorax; wings brown-black with a splendid violet iridescence. The abdomen smooth and shining, the sides and the two apical segments rather closely punctured, in the middle of the three basal segments only a few fine scattered punctures; beneath strongly but not very closely punctured. *Female.* Length 12 lines.

The male resembles the female, but is, if possible, more beautiful in the splendour of its metallic lustre. Length 9 lines.

Hab. Sarawak.

19. *SCOLIA SPECIOSA*. *S. atra*; fronte, macula post-oculari, thoracis maculis duabus frontilibus, metathorace supra, fascia annuli tertii abdominis interrupta, flavis.

Black and shining; the head impunctate; a large bell-shaped macula on the face extending from the margin of the vertex to the insertion of the antennæ, a black spot nearly in the centre of the space enclosing the ocelli; the eyes and a lunate spot behind them yellow. Thorax: a broad yellow stripe on each side in front curving over each tegula, having a straight oblique termination within; the metathorax yellow at the base as far as the margin of the truncation; the whole of the disk of the thorax impunctate, or with only a few widely scattered punctures on the sides of the mesothorax and scutellum: from the anterior angles of the latter a deeply impressed smooth line passes forward, terminating opposite to the anterior margin of the tegulæ; the post-scutellum punctured and the thorax on each side of the scutellum opaque; the wings brown-black, with a splendid violet and blue iridescence, the nervures black. Abdomen: closely punctured, the first segment with a central smooth space at its base; the second segment smooth and shining, except at the sides; the third smooth at the base with a broad transverse yellow stripe slightly interrupted in the middle; beneath, the segments smooth and shining in the middle, and with a few scattered punctures.

Female. Length 15 lines. *Hab.* Sarawak.

This is one of the most beautiful species of the genus, and has not hitherto been captured in any other locality than Borneo.

Gen. *TIPHIA*, *Fabr.*

1. *TIPHIA FUMIPENNIS*. *T. nitida*, atra, punctata; alis anticis fumatis purpureo-iridescentibus.

Female. Length 8 lines. Black, shining, pubescent, with scattered punctures; the mandibles ferruginous, fringed beneath with bright fulvous hairs; the head strongly punctured. The prothorax strongly punctured, its posterior margin impunctate, smooth and shining; the mesothorax strongly punctured; the tegulæ smooth and shining; the superior surface of the metathorax with three central longitudinal elevated lines, the spaces between them rugose; the verge of the truncation and the lateral margins bordered by an elevated line; the surface has a shining silky appearance and is very delicately transversely reticulated; the anterior wings smoky, with a bright purple iridescence; the posterior pair faintly coloured towards their apex; the legs with a glittering white pubescence. Abdomen: smooth and shining; the three apical segments punctured; the apex rufopiceous.

Hab. Borneo (Sarawak).

2. *TIPHIA STIGMA*. *T. nitida*, atra, punctata; alis subhyalinis, stigmate atro.

Male. Length 5 lines. Black, punctured and shining; the elyptus with shining white pubescence; its anterior margin notched; tips of the mandibles ferruginous; the flagellum fuscous beneath; the metathorax with three or four longitudinal elevated lines; wings subhyaline, faintly smoky towards their apex; the nervures pale testaceous; the stigma large and black; the tibiae and tarsi with glittering white pubescence; the calcaria pale testaceous. Abdomen: the first segment much narrower than the second, and subglobose; the following segments thinly covered with sooty-black pubescence.

Hab. Borneo (Sarawak).

3. *TIPHIA FLAVIPENNIS*. *T. nitida*, atra, sparse griseo-pubescent; alis flavescens.

Female. Length 4-5 lines. Black, with scattered punctures: the mandibles ferruginous; the palpi pale testaceous; the flagellum obscurely ferruginous beneath; the scape fringed beneath with long glittering pale hairs; the superior surface of the metathorax, with three longitudinal elevated lines, extending to the verge of the truncation; the outer margin of the tegulae piceous; wings yellowish, their apical margins slightly clouded; stigma small, and as well as the nervures, pale testaceous; the legs with a glittering white pubescence; the calcaria pale testaceous. Abdomen: smooth and shining, with scattered delicate punctures; the margins of the segments thinly fringed with long pale hairs; the apex rufo-piceous.

Hab. Borneo (Sarawak).

Gen. MYZINE, Latr.

1. *MYZINE TRICOLOR*. *M. punctata*, nitida; capite rubro; thorace nigro; abdomine metallico-cyaneo.

Female. Length 10 lines. Head red; the thorax black; the abdomen metallic-blue; the face closely and coarsely punctured; the vertex shining, the punctures finer and more distant; a deep punctured fovea behind the ocelli; the scape in front, and the mandibles ferruginous, the latter black at their tips. Thorax coarsely punctured; the wings brown at their apex, becoming by degrees hyaline at their base, the anterior pair with a bright violet iridescence; the nervures black; the legs strongly spinose, with scattered white pubescence. The abdomen partaking of purple and violet tints in different lights.

Hab. Borneo (Sarawak).

Fam. POMPILIDÆ.

Gen. POMPILUS, Fabr.

This extensive genus of insects, some species of which inhabit

every known country of the world, contains individuals exhibiting great variety, not only in their colouring, but also in their structure and form; one group, which contains the most highly coloured and elegantly formed species, have their tibiæ and tarsi destitute, or nearly so, of spines; another, on the contrary, have their tibiæ more or less spined, the anterior tarsi spined, and frequently pectinated; a third group have the intermediate and posterior tibiæ furnished with a double row of teeth, or serrations, the tarsi being strongly spined. All the above striking differences are, however, linked together by imperceptible modifications; these will always be found, when an extensive collection of these insects, from various countries, are brought together and carefully examined. The differences alluded to are undoubtedly of high value, when investigating the æconomy and habit of the species; thus we find, that the *P. punctum* of Europe, which belongs to the subgenus *Agénia*, in which the species are destitute of spines on the tibiæ, is not a burrowing insect, but constructs tubular cells of mud; *P. rufipes*, on the contrary, is eminently fossorial and has serrated posterior tibiæ, and has also the anterior tarsi furnished with long cilia. In the present paper, I adopt as subgenera, the names given to the groups by Schiödte, in Kröyer's Tidsskrift.

1. **POMPILUS LEUCOPHÆUS.** *P. schistaceo-pubescentis*; facie albo-maculata; prothoracis margine postica alba; alis fuscis basi hyalinis.

Male. Length $5\frac{1}{2}$ lines. Black, covered with slate-coloured pubescence or pile; a spot on each side of the clypeus, the inner orbits of the eyes, not reaching their vertex, a narrower line behind them and the palpi, yellowish-white; the antennæ stout and tapering to their apex; the binder margin of the prothorax white and subangulated; wings brown, becoming gradually hyaline to their base; the tibiæ and tarsi strongly spinose; a white spot on the posterior tibiæ near their base; the calcaria nearly as long as the basal joint of the tarsi. Abdomen densely pilose; the apical margins of the three basal segments naked and shining; the four apical segments beneath, naked and shining.

Hab. Malacca.

2. **POMPILUS VAGABUNDUS.** *P. ater*, guttis maculisque flavis variegatus; alis hyalinis apice fuscis; tibiis posticis ferrugineis.

Female. Length $5\frac{1}{2}$ lines. Black; a line on the inner orbits of the eyes; the anterior margin of the clypeus with a narrow line which unites with a quadrate spot on each side of the clypeus, and a narrow line behind the eyes, yellow; the face with a thin silvery pile, and the cheeks with a few white hairs. Thorax covered with a fine silky white

pile, which is more dense on the coxæ and femora beneath; the posterior margin of the prothorax, and a minute spot on the outer margin of the tegulæ, yellow; the wings hyaline, with a dark fuscous cloud at the apex of the anterior pair: the second submarginal cell twice the width of the third, which is subangular; the nervures fuscous; the calcaria and posterior tibiæ ferruginous, the latter black at their extreme base and apex; the tibiæ and tarsi spinose; the anterior tarsi ciliated. Abdomen covered thinly with a fine changeable pile; a transverse yellow fascia near the base of the second and third segments, the first slightly interrupted in the middle, both widest at the sides; a narrow transverse yellow fascia in the middle of the fifth segment, slightly produced upwards in the middle.

Hab. Borneo (Sarawak).

This species has a strong resemblance to the *P. variegatus* of Europe, but from which it is abundantly distinct.

3. *POMPILUS PULVEROSUS.* *P. ater*, pubesque cinerea tectus; alis hyalinis apice nigro-fuscis.

Male. Length 4 lines. Black; entirely covered with a fine glittering white silky pile; the face silvery; head and thorax smooth, shining and impunctate; the hinder margin of the prothorax subangular; the wings hyaline and iridescent, with a slight fuscous cloud beyond the first submarginal cell; the nervures dark fuscous; the legs spinose, with their calcaria nearly as long as the basal joint of the tarsi. Abdomen with a faint tinge of blue in certain lights.

Hab. Borneo (Sarawak).

Subgen. *PRIOCNEMIS*, *Schiodte*.

4. *PRIOCNEMIS SERICOSOMA.*

Pompilus sericosoma, *Smith, Cat. Hym.* p. 146. no. 137.

Hab. Sumatra. Borneo (Sarawak).

5. *PRIOCNEMIS OPTIMUS.* *P. atra*, capite, thorace, dorso metathoracisque lateribus et maculis basi, coxis intermediis, aureo-pubescentibus; alis nigro-fuscis; femoribus posticis ferrugineis, basi apiceque nigris.

Female. Length 8 lines. Black; the head and scape above covered with golden pubescence; the clypeus convex, somewhat produced in the middle of its anterior margin, which is slightly emarginate and recurved; the apex of the mandibles ferruginous. Thorax: the prothorax, mesothorax, scutellum, and sides of the metathorax posteriorly, covered with golden pubescence; a golden spot at the sides of the pectus, close to the base of the intermediate coxæ; the wings dark fuscous with a beautiful violet iridescence; the posterior margin of the inferior pair subhyaline; legs elongate, the middle of the posterior femora ferruginous; the intermediate and posterior tibiæ with a

double row of serrations. Abdomen subpetiolate and covered with a fine silky pile.

Hab. Singapore.

6. *PRIOCNEMIS VERTICALIS*. *P.* ater; vertice antennarumque articulis basalibus flavis; thorace flavo-guttato; alis, tibiis tarsisque flavis.

Female. Length 9-12 lines. Black; the vertex and face above the antennæ and also the scape, yellow; the first and second joints of the flagellum more or less yellow. Thorax: a line on the posterior margin of the prothorax, a quadrate spot on the disk of the mesothorax touching the scutellum, the latter as well as an ovate spot on the post-scutellum, the outer margins of the tegulæ, the tips of the femora, the tibiæ and tarsi, yellow: the claw-joint of the latter black; the wings yellow with their nervures ferruginous; the wings palest towards their apical margins, their extreme edge indistinctly fuscous; the metathorax transversely striated; the posterior tibiæ with two rows of serrations, the intermediate pairs spinose. Abdomen smooth and shining.

Hab. Malacca (Mount Ophir); Borneo (Sarawak).

This species bears a close resemblance to *P. unifasciata*, Smith, 'Cat. Hym.' iii. p. 145, but independent of a difference in the neuriation of the anterior wings, the armature of the legs is totally different: in *P. unifasciata* the posterior tibiæ are armed with long scattered spines. not serrated, as in the present species.

Subgen. *AGENIA*, Schiödte.

7. *AGENIA BLANDA*.

Pompilus blandus, Guér. *Voy. Coq. Zool.* ii. pt. 2. p. 260.

Hab. Borneo (Sarawak); Singapore; Malacca (Mount Ophir).

8. *AGENIA ATALANTA*. *A.* atra; capite thoraceque flavo notatis; alis flavis fusco terminatis; tibiis tarsisque flavis.

Male. Length 7-7½ lines. Black; covered with fine silky pile. The clypeus, sides of the face, scape in front, a line behind the eyes, the mandibles and palpi, yellow. The posterior margin of the prothorax, the outer margins of the tegulæ, a quadrate spot on the disk of the mesothorax touching the scutellum, and an ovate spot on the scutellum and post-scutellum yellow; the scutellum prominent; the tibiæ, tips of the femora and the tarsi yellow; the apex of the posterior tibiæ and the claws of the tarsi dusky; the metathorax transversely rugose-striate; the wings yellow, the nervures ferruginous; the tips of the anterior and posterior wings dark brown, with a purple iridescence. Abdomen, with a slight metallic lustre.

Hab. Borneo (Sarawak); Singapore.

9. *AGENIA ÆGINA*. *A.* capite abdomineque nigris; thorace sanguineo; alis anticis fascia transversa fusca.

Female. Length 5 lines. Head and abdomen black, the thorax red. The antennæ beneath and the mandibles ferruginous; the palpi elongate, pale testaceous. Thorax: the wings hyaline and iridescent, with a transverse broad dark fascia before the apex of the anterior wings; the nervures pale ferruginous, with a fuscous stain traversing the apical portion of the externo-medial nervure and the basal portion of the transverso-medial nervure; the anterior legs pale ferruginous; the tarsi, the tibiæ and apex of the femora above, fuscous; the intermediate legs fusco-ferruginous, with a yellow spot on the femora beneath towards their base; the posterior legs fusco-ferruginous; the femora yellow, with their apex fuscous. Abdomen smooth and shining, covered with a fine silky pile.

Hab. Borneo (Sarawak).

10. *AGENIA DAPHNE.* *A. atra*; capite thoraceque maculis auratis ornatis; alis subhyalinis, ad apicem subnubeculosis.

Female. Length 8 lines. Black; the face, vertex and clypeus covered with golden pile; the palpi pale testaceous. The prothorax, the apical margin of the disk of the mesothorax, the scutellum, an oblique stripe beneath the wings extending to the intermediate coxæ, the sides of the metathorax and the coxæ, covered with golden pile; the legs with a fine silky pile; the wings subhyaline, with a slight fuscous cloud before the apex of the anterior pair. Abdomen smooth and shining, covered with a fine changeable glittering silky pile.

Hab. Borneo (Sarawak).

11. *AGENIA LAVERNA.* *A. obscure cyanea, fascia albida; alis hyalinis; abdomine petiolato, annulo apicali albido.*

Male. Length 4 lines. Obscure blue, covered with a fine gray silky pile. The face, clypeus, labrum, palpi and scape in front, white; the labrum exserted; the antennæ as long as the body, testaceous beneath. The anterior femora in front, a narrow line in front of the intermediate pair, not extending to their apex, and a minute spot in front on the tegulæ, white; the wings hyaline and beautifully iridescent, the nervures black; the metathorax with a fine transverse granulation. Abdomen petiolated; the apical segment white.

Hab. Borneo (Sarawak).

This species in many respects approaches closely to the species of the genus *Ceropales*: its exserted labrum, white face, and indistinctly observable joints of the antennæ, are all characteristics of that genus, but the cubital nervure does not run to the apical margin of the wing.

12. *AGENIA MELAMPUS.* *A. atra; faciei lateribus, margine clypei antica mandibulisque flavis; alis fuscis basi hyalinis; annulis tribus basalibus abdominis ferrugineis.*

Male. Length $5\frac{1}{2}$ lines. Black; the sides of the face, the anterior margin of the clypeus, the mandibles and scape in front, yellow, tips

of the mandibles ferruginous ; the palpi black. Thorax : the anterior coxæ in front and a minute spot in front of the intermediate pair, yellow ; the apex of the femora beneath and the anterior tibiæ in front, ferruginous ; the posterior femora slightly ferruginous above ; the wings brown with their base hyaline, the posterior pair palest. Abdomen petiolated, with the three basal segments ferruginous ; the apical margin of the third segment dusky, covered with a fine white silky pile.

Hab. Borneo (Sarawak).

13. *AGENIA FLAVOPICTA*. *A. atra* flavo variegata ; pedibus flavis ; alis hyalinis iridescentibus.

Female. Length $3\frac{1}{4}$ lines. Head black ; a broad stripe at the inner orbits of the eyes, the clypeus, labrum, mandibles, palpi and scape in front, yellow ; the flagellum reddish-yellow, fuscous above beyond the first joint. Thorax : the prothorax, tegulæ, scutellum, post-scutellum, the apex of the metathorax and the legs, yellow ; the apical joints of the tarsi fuscous ; the metathorax with a changeable golden pile ; the wings hyaline and beautifully iridescent, the nervures testaceous. Abdomen : the second, third and fourth segments black with a changeable pile, the apical margins testaceous yellow ; the basal and fifth and sixth segments, yellow ; the apical segments incurved ; the sting elongate.

Hab. Singapore.

14. *AGENIA HIPPOLYTE*. *A. atra*, facie metathoracisque lateribus aureo-pubescentibus ; alis flavo-hyalinis ; femoribus posticis ferrugineis, basi apiceque nigris.

Female. Length $6\frac{1}{2}$ lines. Black, with a fine changeable pile ; the face, clypeus and cheeks covered with a dense pale golden pile. The sides of the metathorax and the posterior coxæ above with a dense pale golden pile ; the wings flavo-hyaline, the nervures testaceous ; the posterior femora ferruginous, their base and apex black. Abdomen : distinctly petiolated, the apical margins of the segments narrowly rufo-testaceous ; the sixth segment with a central longitudinal smooth shining space.

15. *AGENIA CELÆNO*. *A. atra*, cinereo-pubescentis ; facie abdomineque argenteo-iridescentibus ; alis hyalinis apice fuscis.

Female. Length $3\frac{1}{2}$ lines. Black ; covered with a changeable cinereous pile, that on the face, coxæ and abdomen having in certain lights a silvery brilliancy ; the tips of the mandibles and the palpi pale testaceous ; the posterior margin of the prothorax curved ; the wings hyaline, with a faint fuscous fascia crossing the superior pair at the second submarginal cell, the apex of the wings narrowly and slightly fuscous ; the apical segment of the abdomen nigro-piceous with the extreme apex pale, very glossy, smooth and shining.

Hab. Singapore.

GEN. MACROMERIS, *St. Farg.*

Macromeris, *St. Farg. Hym.* iii. 4631.

1. MACROMERIS SPLENDIDA.

Macromeris splendida, *St. Farg. Hym.* iii. 464. 2.

Hab. Borneo (Sarawak). India. Java. China. Malacca.

2. MACROMERIS ARGENTIFRONS. *M. ater*, pube argentata tecta; facie dense pubescente; alis subhyalinis; metathorace quadrato.

Female. Length 8 lines. Black; covered with a fine silvery silky pile, very dense and brilliant on the face, base and apex of the metathorax, sides of the prothorax and coxæ; the wings subhyaline, the nervures dark ferruginous; the joints of the anterior tarsi remarkably attenuated at the base; the claws of the tarsi small and unidentate; the tibiae slightly spinose; the thorax subelongate, the sides parallel; the metathorax transversely rugose. Abdomen distinctly petiolated, very smooth and shining, abruptly incurved; the aculeus elongate.

Male. About the same size as the female, similarly clothed with silvery pile; the coxæ greatly swollen; the femora much stouter than in the female, and ferruginous beneath; the anterior tibiae ferruginous within; the posterior tibiae bent inwardly at their base; the thorax gradually widening to the apex of the metathorax, which is finely roughened transversely and margined at the truncation. Abdomen small, distinctly petiolated, and very smooth and shining.

Hab. Borneo (Sarawak). Malacca. Singapore. Java.

GEN. MYGNIMIA, *Smith.*

This genus of *Pompilidæ* contains all those species which have the first recurrent nervure uniting with the second transverso-cubital nervure, the posterior tibiae strongly serrated, with a double row of short spines. These insects are in fact the representatives of the *Pepsis* of South America, and embrace some of the largest and most beautiful species of *Pompilidæ*; all, with one solitary exception, (a species from Mexico), are inhabitants of the Old World; *Pepsis*, on the contrary, is almost exclusively found in the New World: I am only acquainted with four exceptions, three being African, and one from Singapore.

1. MYGNIMIA FLAVA.

Pompilus flavus, *Fabr. Syst. Piez.* p. 197.

Hemipepsis flavus, *Dahlb. Hym. Europ.* p. 123.

Hab. Borneo (Sarawak). Malacca (Mount Ophir). Singapore. India.

2. MYGNIMIA ANTHRACINA.

Mygnimia anthracina, *Smith, Cat. Hym.* pt. iii. 183.

Hab. Borneo (Sarawak). Malacca and Singapore.

3. *MYGNIMIA DUCALIS*. *M. atra*; alis nigris, anticis fascia argentata ornatis.

Black; the abdomen blue-black with a fine silky pile; the third and following joints of the flagellum fuscous, the tips of the joints ferruginous; the elypeus, the sentellum and post-sentellum, obscurely fusco-ferruginous; the metathorax transversely striated, and truncate at the apex; the margin of the truncation raised; the wings brown-black with bright violet and purple shades; a broad silvery band crosses the anterior wings beyond their middle, the band consisting of fine silvery pile. *Female*. Length 1 inch $\frac{3}{4}$.

Hab. Malacca (Mount Ophir).

4. *MYGNIMIA PRINCEPS*. *M. atra*; antennis flavis, alis nigris, anticis fascia subhyalina ornatis.

Female. Length 1 inch 10 lines. Black; with obscure shades of blue, the abdomen blue-black, covered with a fine pile which partakes of purple or blue shades in different lights. The scape of the antennæ ferruginous in front, the flagellum yellow; a ferruginous line bordering the anterior margin of the elypeus. Thorax: the hinder margin of the sentellum obscurely ferruginous; the metathorax coarsely transversely striated; the posterior tibiæ and basal joint of the tarsi with a fine changeable ferruginous pile within; the wings brown-black, with a broad sub-hyaline transverse fascia beyond the middle, the fascia tinged with yellow.

Hab. Borneo (Sarawak).

5. *MYGNIMIA IRIDIPENNIS*.

Female. Length 1 inch. Black; the elypeus densely covered with a short dense black pubescence, slightly emarginate in front; the mandibles obscurely ferruginous in the middle. Thorax: the wings with a splendid lustre of coppery and violet tints, beneath, equally vivid in colour; the metathorax coarsely striated transversely; the pro- and meso-thorax with a short black velvety pubescence. Abdomen sub-opaque, with shades of blue in certain lights.

Hab. Malacca. Sarawak.

Fam. SPHEGIDÆ.

Gen. AMPULEX, *Jurine*.

1. *AMPULEX HOSPES*, *Smith, Cat. Hym.* pt. iv. p. 272.

The particulars in which this remarkable species differs from those with which I have associated it, would perhaps warrant the establishment of a new genus, but only a few specimens have yet been obtained; and although in all, the first transverse cubital nervure is obsolete, still it is a circumstance of frequent occurrence in the genus, particularly in the typical species *A. compressa*. The antennæ are much stouter and shorter, and the posterior angles of the thorax without spines, in all which particulars it differs from the rest of the genus.

2. *AMPULEX COMPRESSA*.

Chlorion compressum, *Fabr. Syst. Piez.* p. 219.

Hab. Malacca (Mount Ophir). Borneo (Sarawak).

3. *AMPULEX SMARAGDINA*. *A. læte viridis*; pedibus abdomineque purpureis; prothorace tuberculato; alis anticis obscure unifasciatis.

Female. Length 8 lines. Brilliant green with shades of violet and coppery effulgence; the vertex angulated, the sides oblique from the margin of the eyes; the antennæ shorter and much thicker than in *A. insularis*. The prothorax subtuberculate in front; the mesothorax, scutellum and post-scutellum, smooth and shining, the former with a longitudinal coppery vitta in middle; the wings subhyaline; the anterior pair with a slight fuscous cloud crossing them from the marginal cell; the legs bright purple; the anterior pair with their coxæ beneath, their femora and tibiæ in front ferruginous. Abdomen brilliant purple, smooth, shining and impunctate.

Hab. Singapore.

4. *AMPULEX INSULARIS*. *A. fulgide viridis*, abdomine purpureo lavato; prothorace elongato, lævigato, nitido, sine tuberculis; alis anticis fasciatis.

Female. Length 8 lines. Brilliant green; the head smooth and shining; the vertex subquadrate with the posterior angles rounded; the clypeus covered with silvery pubescence; the mandibles ferruginous; the antennæ black. The prothorax smooth and shining, not tuberculate; the mesothorax, scutellum and post-scutellum, smooth and shining; the metathorax transversely striated, and having a central and three lateral carinæ, the third recurved inwards at the apex; the sides margined, the apical angles produced into short acute teeth; the wings subhyaline with a fuscous cloud crossing the anterior pair at, and being the width of, the marginal cell; the tibiæ and tarsi obscurely æneous. Abdomen: very smooth and shining, with purple and violet tints; the apex compressed at the sides; the first segment much narrower than the second.

Hab. Borneo (Sarawak).

Gen. *TRIROGMA*, *Westw.*1. *TRIROGMA CÆRULEA*.

Trirogma cærulea, *Westw. Trans. Ent. Soc. Lond.* iii. 225 ♂. *Arcana. Ent.* ii. p. 66 ♀.

Hab. Singapore. Northern India and Madras.

2. *TRIROGMA PRISMATICA*. *T. fulgide cæruleo-viridis*; abdomine purpureo et violaceo lavato.

Male. Length 6 lines. Brilliant green, the abdomen vivid purple or violet in different lights, highly prismatic; the palpi and mandibles white, the latter ferruginous at their apex; the scape of the antennæ green with purple reflexions, the flagellum fuscous; the face below

the antennæ, the scape, cheeks and mandibles, thinly covered with long white pubescence; the head coarsely punctured; a deep transverse impressed line behind the ocelli, the vertex impunctate. Thorax: the prothorax forming a neck, with two elevated tubercles behind; the mesothorax with three or four transverse elevated carinæ at the base, the spaces between rugose; the disk behind, smooth and shining; the scutellum with an elevated shining tubercle in the middle; the metathorax smooth and shining, with an elevated carina traversing its margins; the lateral margins produced at the sides into a blunt angle or tooth; the disk with two longitudinal carinæ which curve towards the sides, then inwardly towards the apical margin, not quite meeting in the centre; between the curved carinæ are two central and two lateral ones, none extending to the outward ones; wings subhyaline and splendidly iridescent; the thorax at the sides and beneath, and also the abdomen, thinly clothed with white pubescence; the third segment above, with scattered short white hairs. Abdomen very delicately and distantly punctured.

Hab. Borneo (Sarawak).

This beautiful species is very distinct from the *Trirogma cerulea*, the only species previously known; the antennæ are much longer and perfectly filiform, the apex of the joints not thickened as in that species.

Gen. SPHEX, *Fabr.*

1. SPHEX SERICEA.

Sphex sericea, *Fabr. Syst. Piez.* p. 211, 19.

Hab. Borneo (Sarawak). Malacca.

This species is very widely distributed: we have seen examples from the islands of the Pacific, the Philippine Islands and Java; some specimens have the scutellum and post-scutellum black; in all probability the *S. ferruginea* of St. Fargeau is a variety of this insect.

2. SPHEX NIGRIPES.

Sphex nigripes, *Smith, Cat. Hym.* pt. 4. p. 254 ♀.

Hab. Singapore. Sumatra.

3. SPHEX DIABOLICUS. *S. ater*; metathorace densissime nigro-pubescent; alis flavo-hyalinis basi fuscis, apice subnubeculosis.

Female. Length 14 lines. Black; the head and thorax opaque; the mandibles very stout, foreipate, acute at their apex and having a stout tooth in the middle of their inner edge; their outer margins fringed with long hairs; the face thinly covered with black pubescence. Thorax: the metathorax covered with a dense black pubescence; a similar-coloured pubescence, but more sparing, clothes the thorax on the sides and beneath; wings flavo-hyaline, blackish at their base;

the apical margins of the anterior pair with a pale fuscous border ; the nervures ferruginous. Abdomen : sub-opake, smooth and slightly shining.

Hab. Borneo (Sarawak).

Gen. PELOPÆUS, *Latr.*

1. PELOPÆUS JAVANUS.

Pelopæus Javanus, *St. Farg. Hym.* iii. p. 309.

Hab. Borneo (Sarawak). Malacca. Java.

2. PELOPÆUS FERVENS. *P. ater*; elypeo seapoque antice, pedibus abdomineque ferrugineis ; alis subhyalinis.

Female. Length 8 lines. Black ; the scape in front, the elypeus and tips of the mandibles ferruginous. Thorax : the posterior margin of the prothorax, the tegulæ, a transverse line at the base of the scutellum, the tips of the anterior and intermediate femora, the posterior pair, except their base, the tibiæ and tarsi, ferruginous ; the apical joints of the tarsi fuscous ; the wings subhyaline, with a black spot at the apex of the superior pair ; the nervures ferruginous ; the mesothorax finely striated transversely, the metathorax much more strongly so ; the head and thorax thinly covered with long thin pale pubescence. Abdomen : ferruginous, with the base of the petiole black ; the three apical segments fusco-ferruginous.

Hab. Borneo (Sarawak).

Fam. LARRIDÆ, *Leach.*

Gen. TACHYTES, *Panzer.*

1. TACHYTES NITIDULUS.

Crabro nitidulus, *Fabr. Piez. Syst.* 309. 7.

Hab. India. Borneo.

2. TACHYTES ARGENTATUS.

Tachytes argentata, *Brullé, Exped. Sc. de Morée*, iii. p. 372.

Hab. Singapore. The Morea. Albania.

3. TACHYTES AURIFEX. *T. ater*; facie aurate pubescente ; pedibus ferrugineis ; alis flavo-hyalinis ; abdomine aurato-fasciato.

Female. Length $10\frac{1}{2}$ lines. Black ; the face densely clothed with golden pubescence ; the cheeks and vertex behind, with a changeable golden pile ; the scape and mandibles at their base, ferruginous, the former black at their base above ; the palpi pale ferruginous. Thorax : with a changeable golden pubescence, very dense and shining on the posterior margin of the prothorax, the margins of the mesothorax and on the post-scutellum ; the tegulæ and legs ferruginous ; the coxæ and femora fuscous ; the wings flavo-hyaline, palest towards the apical margins, which have a pale fuscous narrow border. Abdomen :

fusco-ferruginous at the apex ; covered with a thin changeable golden pile ; each segment with a bright golden fascia on its apical margin ; beneath smooth and shining, with the apical margins of the segments rufo-piceous.

Hab. Borneo (Sarawak).

GEN. LARRADA, *Smith*.

1. LARRADA EXILIPES.

Larrada exilipes, *Smith, Cat. Hym.* pt. 4. p. 278.

Hab. Borneo (Sarawak).

2. LARRADA CARBONARIA. *L. nigerrima*; capite abdomineque nitidis; thorace opaco; alis rufescenti-fuscis, purpureo læte micantibus.

Female. Length 10 lines. Jet-black, shining; the clypeus delicately punctured; the flagellum fuscous; the cheeks with a fine cinereous pile. Thorax: the pro- and meso-thorax, the scutellum and post-scutellum closely punctured; the metathorax elongate, its superior surface finely shagreened; the truncation finely strigose; the tegulæ testaceous; the wings brown, with a brilliant violet iridescence; the legs strongly spinose. Abdomen: as long as the head and thorax, being smooth, shining and very delicately and sparingly punctured.

Hab. Singapore.

3. LARRADA SYCORAX. *L. nigerrima*, lævigata, nitida, punctata; alis fuscis violaceo-iridescentibus.

Female. Length $7\frac{1}{2}$ lines. Jet-black; shining and finely punctured; the face and cheeks covered with silvery pubescence interspersed with long pale hairs; the metathorax oblong, truncated at the apex; the superior surface with a central impressed longitudinal line, on each side of which it is delicately striated obliquely. The thorax: beneath, the sides and also the legs, covered with a cinereous pile, and sprinkled with long white hairs; the wings brown, with a violet iridescence; their base, as well as the posterior pair, palest. Abdomen: smooth, shining and very delicately and distantly punctured; the margins of the segments slightly depressed and glittering in certain lights with silvery pile.

Hab. Borneo (Sarawak).

4. LARRADA POLITA. *L. nigra*; capite abdomineque nitidis; thorace opaco; femoribus tibiisque intermediis posticis ferrugineis; alis fusco-hyalinis.

Female. Length 6 lines. Black; the head shining, the clypeus closely and finely punctured and covered with silvery pile; the mandibles ferruginous. The pro- and meso-thorax closely punctured, thinly covered with a short glittering pubescence; the metathorax transversely rugose; the thorax on the sides and beneath covered with a fine changeable silvery pile; the intermediate and posterior femora and tibiæ, bright ferruginous; the wings fusco-hyaline and iridescent.

Abdomen : elongate, smooth, shining, and covered with a thin changeable glittering silvery pile ; the apex acute and having a produced ferruginous style.

Hab. Borneo (Sarawak).

5. LARRADA TISIPHONE. *L. nigerrima*; capite thoraceque subopacis; metathorace reticulato; alis fusco-hyalinis.

Female. Length 4 lines. Black; the head very delicately and closely punctured, sub-opaque; the face and clypeus covered with silvery pubescence, the mandibles ferruginous at their apex; the cheeks with a bright silvery pile. Thorax: the pro- and mesothorax closely and finely punctured, the scutellum more delicately and sparingly so, the former sub-opaque, the latter shining; the metathorax coarsely reticulated; the tegulæ piceous; the wings fusco-hyaline and iridescent, the nervures black; the thorax beneath, and the legs, covered with a fine silky pile. Abdomen: smooth and shining, the apical margins of the segments with fasciæ of silvery pile, only observable in certain lights.

Hab. Borneo (Sarawak).

6. LARRADA ALECTO. *L. nigerrima*; capite thoraceque subopacis; metathorace reticulato; alis fusco-hyalinis.

Female. Length $5\frac{1}{2}$ lines. Jet-black; the head shining; the cheeks with a silvery down; the clypeus impunctate; the mandibles ferruginous; the palpi rufo-testaceous. The mesothorax shining, closely and finely punctured; the scutellum shining; the metathorax rugose, more finely so towards the verge of the truncation, the latter transversely rugose; the tegulæ rufo-testaceous; wings fusco-hyaline, splendidly iridescent, with the nervures black; the legs strongly spinose, the knees somewhat ferruginous. Abdomen: smooth, shining and impunctate.

Hab. Singapore.

Gen. LARRA, *Fabr.*

1. LARRA PRISMATICA. *L. nigra*, pulchre prismatica, maculis fascisque variis flavis ornata.

Female. Length 4-5 lines. Black, with prismatic tints of violet and blue, particularly on the abdomen. The palpi, labrum, clypeus and a triangular space above it, an abbreviated line at the inner orbits of the eyes, the scape in front and the flagellum beneath, yellow; the clypeus emarginate in its entire width and a black transverse spot in the middle, a similar spot at the base of the labrum, which is rounded in front. The posterior margin of the prothorax, the tubercles, the outer margins of the tegulæ, an oblique spot on each side of the scutellum, a transverse line on the post-scutellum and an elongate spot on the lateral margins of the metathorax, yellow, the margins compressed; the anterior legs with the femora beneath and a spot at their apex above, and the tibiæ and tarsi in front, yellow, the claw-joint entirely so;

the intermediate legs with a line on the femora behind, a spot at their apex in front, the tibiæ in front as well as the tarsi, yellow; the posterior legs with a stripe on the tibiæ in front at their base; the wings hyaline and iridescent. Abdomen: an elongate transverse yellow macula on each side of the basal segment near its apical margin, a yellow fascia on the apical margin of the second segment, widest at the sides, an abbreviated fascia in the middle of the third, an entire one on the fourth, and a spot on each side of the fifth.

Male. Differs in having the clypeus black, two parallel abbreviated yellow lines on the disk of the mesothorax and the fasciæ on the abdomen entire, that on the basal segment being very broad and deeply notched in the middle.

Hab. Borneo (Sarawak).

I have here restored the name *Larra* to one of the insects agreeing with the type, *L. vespiformis*,—the *Stizus vespiformis* of many authors.

Gen. PISON, *Spin.*

1. PISON SUSPICIOSUS. *P. niger*; capite thoraceque rude punctatis; abdomine lævigato, nitido; facie pube argentea ornata.

Female. Length 4 lines. Black; the face with silvery pubescence; the palpi testaceous; the tips of the mandibles ferruginous; the head and thorax strongly and closely punctured, the clypeus finely so. Thorax: the tegulæ testaceous; the wings fusco-hyaline; the first recurrent nervure received at the apex of the first submarginal cell; the second at the apex of the second submarginal; the nervures dark fuscous; the metathorax with a number of coarse radiating striæ at its base; the truncation transversely rugose. Abdomen: very smooth and shining, with a few delicate scattered punctures; the margins of the segments depressed.

Hab. Singapore.

This species very closely resembles the *Pison rugosus*, but it differs from that species in the venuration of the wings, and also in the puncturing of the abdomen; I suspect that an example in fine condition would have silvery bands on the abdomen.

Subgen. PISONOIDES, *Shuck.*

The anterior wings with one marginal cell, and two submarginal cells, each receiving a recurrent nervure.

1. PISONOIDES OBLITERATUS. *P. ater*, glaber, tenuissime punctatus; facie argenteo-villosa; alis hyalinis iridescentibus; metathoracis basi lævi.

Female. Length $3\frac{1}{2}$ lines. Black; the head and thorax punctured, the mesothorax rather distantly so; the clypeus and the notch of the eyes

with a silvery pubescence; the tips of the mandibles ferruginous; the tegulae testaceous; the nervures brown; the costal nervure and the stigma black; the tibiae and tarsi simple; the metathorax with a deep triangular depression at its base, which is obliquely striated on each side, and from which a deep smooth channel runs to the apex of the metathorax; on each side of the depression it is smooth and shining, and finely punctured beyond. Abdomen highly polished, with the margins of the segments deeply depressed; the apical margins with a fine short silky white pubescence; the sixth segment acute at the apex.

Hab. Borneo (Sarawak).

I have formed a section for the reception of this species, which I regard as a true *Pison*, having the petiolated cell obsolete, or rather the apical nervure of the usually enclosed cell. I have seen other species with the nervure obsolete in both, or sometimes only in one wing; the latter circumstance confirms my opinion of this species only being an exceptional case, and that it is a true *Pison*.

Fam. BEMBICIDÆ, *Westw.*

Gen. BEMBEX, *Fabr.*

Bembex melancholica, *Smith, Cat. Hym.* pt. iv. p. 328.

Hab. Borneo (Sarawak). Sumatra.

Fam. CRABRONIDÆ, *Leach.*

Gen. TRYPOXYLON, *Latr.*

1. *Trypoxylon bicolor*, *Smith, Cat. Hym.* pt. iv. p. 377.

Hab. Singapore. Madras.

2. *TRYPOXYLON PETIOLATUM*. *T. nigrum nitidum*, petiolo gracili elongato; abdominis articulis secundo et tertio ferrugineis.

Female. Length 7 lines. Black, very smooth and shining; the elytra, the inner orbits of the eyes, the emargination of the eyes, and the cheeks, with a glittering silvery pile; the mandibles ferruginous; the palpi pale testaceous. Thorax: the tegulae, anterior and intermediate tarsi, the extreme base of the posterior tibiae, the calcaria, and the claws and pulvillus of the tarsi, pale rufo-testaceous; the apical joints of the tarsi fuscous; the sides of the thorax sprinkled with glittering silvery hairs; the wings hyaline, the nervures rufo-fuscous. Abdomen: the petiole slender, as long as the head and thorax, with the apex of its node, the second and third segments, ferruginous; covered with a fine changeable pile, only observable in certain lights.

Hab. Borneo (Sarawak).

3. *TRYPOXYON COLORATUM*. *T. nigrum*, læve, nitidum; pedibus pallide ferrugineis, abdomine subferrugineo supra, obscure maculato.

Male. Length $7\frac{1}{2}$ lines. Black, smooth and shining; the clypeus, mandibles, palpi and scape of the antennæ, covered with golden pile; the cheeks and the emargination of the eyes with a glittering pale golden pile. Thorax: the posterior margin of the prothorax, the tegulæ, tubercles and legs, pale ferruginous; the intermediate and posterior tibiæ beneath, and also the tarsi, fuscous; the apex of the joints of the latter ferruginous; the wings hyaline, their nervures ferruginous, the stigma pale; the sides of the thorax and the metathorax with golden pubescence. Abdomen rufo-testaceous; the petiole, except its base, above, the node at its apex, above, as well as all the segments, more or less black, or rufo-fuscous above; the base and apex of the segments, as well as the apical segment entirely, pale; beneath entirely pale.

Hab. Borneo (Sarawak).

This species is about the size of *T. bicolor*, which it very much resembles, but from which it is very distinct.

GEN. CRABRO, *Fabr.*

1. *CRABRO FAMILIARIS*. *C. niger*, ocellis triangulariter ordinatis, mesothorace punctulato, pedibus flavis, metathorace lævi nitido, abdomine pubescente.

Male. Length $2\frac{1}{2}$ lines. Black: head a little wider than the thorax, shining and delicately punctured; the stemmata in a triangle; the clypeus and cheeks with silvery pubescence; the scape yellow; the flagellum rufo-testaceous, slightly fuscous above; the palpi pale testaceous; the mandibles ferruginous at their apex. Thorax: the collar, tubercles, tegulæ, scutellum and post-scutellum, the extreme base of the wings, and the legs, of a sulphur-yellow; the wings hyaline and splendidly iridescent; the base of the femora and the coxæ slightly ferruginous; the mesothorax delicately punctured; the metathorax smooth and shining, with a central impressed fovea. Abdomen pubescent, with the apical margins of the segments rufo-piceous.

Hab. Borneo (Sarawak).

2. *CRABRO RUGOSUS*. *C. niger*, ocellis triangulariter ordinatis in vertice, mesothorace longitudinaliter striato, metathorace rugoso.

Male. Length $2\frac{1}{2}$ lines. Black: head wider than the thorax, quadrate; the stemmata in a triangle on the vertex; an impressed line in front of the anterior stemma extending to the sulcation on the face; an impressed line running round the orbits of the eyes; the cheeks and face with a dense silvery pubescence; the scape yellow; the tips of the mandibles ferruginous. Thorax: an interrupted line on the collar, the tubercles, two spots on the scutellum, the post-scutellum, the tips of the anterior femora, all the tibiæ at their base,

and the basal joint of the tarsi, yellow; the apical joints of the tarsi rufo-fuscous; the yellow markings on the legs paler than those on the thorax; the mesothorax deeply striated longitudinally; the metathorax rugose; the wings hyaline and iridescent. Abdomen: the four basal segments with a small ovate yellow spot at their extreme lateral margins; the fifth with a yellow fascia at its base.

Hab. Borneo (Sarawak).

This species has a remarkably close resemblance to the *Crabro Panzeri* of this country.

Gen. MELLINUS, *Fabr.*

1. MELLINUS CRABRONIFORMIS. *M. niger*, scapo palpis mandibulis tuberculis pedibusque flavis, abdomine ferrugineo.

Female. Length 4 lines. The head and thorax black; the legs and abdomen pale ferruginous; the head and thorax with a thin glittering pale golden pubescence; the palpi, mandibles and scape of a yellowish white; the flagellum testaceous, yellow beneath. Thorax smooth and shining; the tegulæ and base of the wings of a yellowish white; the wings hyaline and splendidly iridescent; the nervures testaceous; the metathorax with a subenclosed space at its base, with a row of sulcations along the basal margin; the sides and apex of the metathorax rugose. Abdomen pale ferruginous, smooth, shining and pubescent; the basal segment petiolated, the petiole curved, clavate at the apex.

Hab. Borneo (Sarawak).

I am aware that this insect, if a strict adherence to the neururation of the wings, as a character for generic subdivision, were rigidly adopted, would form a type of a new genus, but the difference is too slight in my opinion to justify such a course; in other respects it agrees with the insects included in the genus *Mellinus*; the principal difference in the neururation of the present species is the elongation of the third discoidal cell.

Gen. CERCERIS, *Latr.*

1. CERCERIS SEPULCRALIS. *C. capite thoraceque nigris*, abdomine ferrugineo.

Female. Length $7\frac{1}{2}$ lines. Black, with the abdomen ferruginous; the head and thorax finely shagreened; the face with a silvery-white pubescence; the carina between the antennæ, an ovate spot on the clypeus, and the mandibles, obscurely rufo-testaceous. Thorax: a minute obscure spot on the posterior margin of the prothorax, laterally, and a distinct spot on the tegulæ in front, pale yellow; the wings brown, their base subhyaline; the sides of the metathorax covered with hoary pubescence; an indistinct pale spot on the inter-

mediate and posterior tibiæ, outside; the apical joints of the anterior tarsi, and the calcaria, pale testaceous; the tarsi beneath, and the posterior tibiæ within, clothed with a golden-yellow pubescence.

Hab. Borneo (Sarawak).

Group SOLITARY WASPS.

Fam. EUMENIDÆ.

Gen. GAYELLA, *Saussure*.

1. GAYELLA PULCHELLA. *G. nigra*, punctata, subnitida, flavo-guttata et fasciata, pedibus ferrugineis flavo-guttatis, alis subhyalinis et iridescentibus.

Female. Length 10 lines. Black: head quadrate; the clypeus deeply emarginate in front, the angles of the emargination produced and denticulate; a large oblong spot behind the eyes, two oblique lines on the vertex nearly touching the summit of the eyes and inclined inwards, a stripe at the base of the scape in front, the labrum and mandibles, yellow. Thorax: the prothorax in front, two longitudinal abbreviated lines on the disk of the mesothorax, the tegulæ in front and behind, a slightly interrupted transverse line on the scutellum and post-scutellum; a spot beneath the wings, and the sides of the metathorax, yellow; the legs ferruginous; a stripe on the anterior femora outside, another on the anterior and intermediate tibiæ, and a spot at the apex of the posterior pair, yellow; the tibiæ and tarsi fuscous; the wings fusco-hyaline; the anterior margin of the superior pair yellowish, their apex slightly clouded. Abdomen: the lateral and apical margins of the petiole, an ovate spot on each side of the basal segment, a fascia a little before the apical margins of the first, second and third segments, yellow; beneath black.

Hab. Borneo (Sarawak).

Gen. EUMENES.

1. *Eumenes flavopicta*.
Eumenes flavopicta, *Blanch. Dict. d'Hist. Nat. de Ch., d'Orb. Ins.* pl. 2. fig. 2.
Hab. Singapore.
2. *Eumenes Blanchardi*, *Sauss. Mon. Guêpes, Sol.* p. 66.
Hab. Borneo (Sarawak).
3. *Eumenes quadrispinosa*, *Sauss. Mon. Guêpes, Suppl.* p. 134. pl. 7. fig. 2 ♀.
Hab. Malacca.
4. *Eumenes xanthura*, *Sauss. Mon. Guêpes, Sol.* p. 46.
Eumenes circinalis, *Fabr. Syst. Piez.* p. 286 (var.?).
Hab. Borneo (Sarawak).

5. *Eumenes hæmorrhoidalis*.

Vespa hæmorrhoidalis, *Fabr. Syst. Piez.* p. 259.

Hab. Borneo (Sarawak).

6. *Eumenes quadrata*, *Smith, Trans. Ent. Soc. Lond.* n. ser. ii. p. 36.

Hab. Borneo (Sarawak).

The specimens from Sarawak only differ from those from China in having the tibiæ and tarsi paler.

7. *EUMENES INCONSPICUA*. *E. nigra flavo-variegata*, capite thoraceque dense punctato, abdomine sublævigato nitido.

Female. Length 5 lines. Black: the clypeus deeply emarginate at the apex, the angles acute; the basal portion of the clypeus yellow, with a yellow spot above between the antennæ, and a narrow abbreviated yellow line behind the eyes; the tips of the mandibles, and the apex of the flagellum beneath, ferruginous. Thorax: an abbreviated line on the posterior margin of the prothorax in the middle, a spot beneath the wings and another before it, the tegulæ, a spot behind them, the post-scutellum, two spots on each side of the metathorax, the tips of the femora and the tibiæ, yellow; the anterior tarsi yellow, the intermediate and posterior pairs dusky; the intermediate and posterior tibiæ fusco-ferruginous beneath; wings subhyaline, the anterior margin of the superior pair fuscous. Abdomen: a minute spot on each side of the petiole, its apical margin, a larger spot on each side of the second segment and its apical margin, yellow; the following segments with a silky pubescence.

Hab. Borneo (Sarawak).

8. *EUMENES SINGULARIS*. *E. nigra flavo-variegata*, capite thorace petioleque (ad apicem excepto) rude punctato; abdomine lævigato nitido.

Female. Length 6 lines. Black: the basal and the lateral margins of the clypeus, an oblong spot between the antennæ, a minute spot in the sinus of the eyes and a short line behind them, yellow; the apex of the antennæ ferruginous beneath. Thorax suborbicular; the prothorax in front, two spots on each tegula and another behind them, a transverse line on each side of the metathorax at its base, two ovate ones at its apex, and a spot beneath the wings, yellow; the anterior femora at their apex, the tibiæ, and the intermediate and posterior tibiæ outside, yellow; the wings fusco-hyaline, and iridescent, their apical margins darkest. Abdomen: the petiole longer than the head and thorax; the apical margin of the petiole, an ovate spot on each side of the first segment, its apical margin, and a line in the middle of that of the following segment, yellow; the thorax and abdomen beneath with a fine griseous pile.

Hab. Borneo (Sarawak).

Gen. RHYNCHIUM, *Spinola*.

1. *Rhynchium hæmorrhoidale*.
Vespa hæmorrhoidalis, *Fabr. Syst. Piez.* p. 259.
Hab. Singapore. Malacca.
2. *Rhynchium sanguineum*, *Sauss. Mon. Guêpes, Sol.* p. 110 (var. *R. hæmorrhoidalis*).
Hab. Borneo (Sarawak).
3. *Rhynchium metallicum*, *Sauss. Mon. Guêpes, Sol.* p. 114.
Hab. Borneo (Sarawak).
4. *Rhynchium nitidulum*.
Vespa nitidula, *Fabr. Syst. Piez.* p. 260.
Hab. Borneo (Sarawak).

The specimens from Borneo have the clypeus strongly punctured; in other respects they agree precisely with Indian and Javanese examples.

5. RHYNCHIUM OBSCURUM. *R. capite thoraceque rude punctatis, alis apice nigris, abdominis segmento primo rubro-fasciato.*
Female. Length 6 lines. Black: the head and thorax very coarsely punctured; the margins of the clypeus covered with silvery pile; the face with scattered, short, griseous pubescence. Thorax: the tegulæ black and shining; the wings fusco-hyaline; a dark stain along the anterior margin of the externo-medial cell, and a dark fuscous cloud beyond the second submarginal cell occupying the entire apex of the wings. Abdomen: opaque black, the apical margin of the first segment with an obscure ferruginous band; the apical margins of the following segments slightly and very obscurely ferruginous, and covered with fusco-ferruginous pubescence.
Hab. Borneo (Sarawak).

Gen. ODYNERUS, *Latr.*

1. *Odynerus flavo-lineatus*, *Smith, Cat. Hym.* pt. v. p. 60.
Hab. Malacca (Mount Ophir). Java.
2. ODYNERUS MANIFESTUS. *O. niger, capite thoraceque rude et confluentè punctatis, clypeo scapo pedibus et prothorace flavo-guttatis, abdomine fasciis duabus flavis ornato.*
Male. Length 5 lines. Black: the head and thorax covered with deep coarse confluent punctures; a spot on each side of the clypeus, a line on the scape in front, and another behind the eyes, yellow; the clypeus produced and truncate in front. Thorax: a line on the posterior margin of the prothorax in the middle, a spot on the tegulæ in front and behind, the post-scutellum, the apex of the anterior and intermediate femora, and all the tibiæ outside, yellow; the tarsi black; wings subhyaline, the nervures black; the anterior margin of the

superior pair fuscous. Abdomen shining and delicately punctured; the first and second segments with a yellow fascia on their apical margins.

Hab. Borneo.

3. *ODYNERUS SEPTEN-FASCIATUS*. *O. niger* capite thoraceque profunde punctatis flavoque variegatis, abdominis segmentis flavo-marginatis, segmento secundo flavo-fasciato.

Male. Length 5 lines. Black: head and thorax deeply, but not coarsely punctured; the margins of the clypeus, the labrum, mandibles, scape in front, the sinus of the eyes, a longitudinal stripe running from the anterior stemma to the insertion of the antennæ, and a line behind the eyes, yellow. Thorax: a transverse line on the prothorax in front, not touching its anterior angles, two longitudinal abbreviated lines on the disk of the mesothorax, the tegulæ, two spots on the scutellum, the post-scutellum, the sides of the metathorax, a spot beneath the wings, an oblique line beneath it, and a similar line running down to the posterior coxæ, yellow; the legs yellow, with a fuscous line on the femora above and on the tibiæ behind. Abdomen: the anterior, posterior and lateral margins of the basal segment yellow; a fascia across the middle of the second segment, and another a little before its apical margin, and also before the margins of the three following segments, yellow; beneath, the second segment yellow, with an oblong black spot in the middle; the apical margins of the three following segments yellow.

Hab. Borneo (Sarawak).

4. *ODYNERUS MACULIPENNIS*. *O. niger*, punctatus, capite thoraceque flavo-guttatis, abdominis segmentis singulis flavo-fasciatis, alis apice nigro unimaculatis.

Female. Length $3\frac{1}{2}$ lines. Black: the clypeus, mandibles, antennæ beneath, a spot between them, another in the sinus of the eyes, and a stripe behind them, yellow; the antennæ rufo-fuscous above; the mandibles ferruginous at their apex. Thorax: the anterior margin of the prothorax, the tegulæ and a spot behind them, a spot beneath the wings, the scutellum, a line on the post-scutellum and the sides of the metathorax, yellow; the legs yellow, with the coxæ and the femora above, more or less fuscous; the wings hyaline, with a black spot occupying the greater part of the marginal cell and passing off beyond it to the apex of the wings; the nervures fuscous. Abdomen shining and delicately punctured; the first segment short and cup-shaped, its apical margin thickened; the second segment much wider than the first, its sides rounded; a yellow fascia on the apical margins of the segments, that on the third segment much narrower than the others; an ovate spot on each side of the second segment, at its lateral margins, at the base.

Hab. Borneo (Sarawak).

This species is closely allied to the *O. miniatus* of Saussure.

5. *ODYNERUS MULTIPICTUS*. *O. niger*, capite thoraceque rude punctatis et flavo-variegatis, pedibus flavis, alis hyalinis apice fuscatis, abdomine flavo-fasciato.

Female. Length $5\frac{1}{2}$ lines. Black: the head and thorax rugose-punctate; the mandibles, clypeus, sinus of the eyes, a longitudinal line running from the anterior ocellus to the insertion of the antennæ, a parallel line on each side of the ocelli touching the eyes, a broad stripe behind the eyes, and the scape in front, yellow; a black spot in the centre of the clypeus, and the apex of the mandibles, ferruginous; the flagellum fulvous beneath. The prothorax in front, two longitudinal lines on the mesothorax, two ovate spots on the scutellum, the sides of the metathorax with a large angular spot, the tegulæ, a spot and an oblique line beneath them, and also the legs, yellow; a line on the femora above and on the tibiæ behind, and the coxæ spotted with fuscous; a black spot on the tegulæ; the wings subhyaline and iridescent; a dark cloud on the anterior margin of the superior pair towards their apex. Abdomen smooth and shining; a yellow fascia on the apical margins of the segments, and also a fascia at the base of the first segment, with a transverse spot on each side of the second segment; beneath, the second segment yellow, with a black quadrate spot at its base, a yellow fascia on the apical margins of the following segments.

Hab. Borneo (Sarawak).

6. *ODYNERUS LATIPENNIS*. *O. niger*, angustus, elongatus, alis amplis apice nigro-maculatis, capite thoraceque flavo-guttatis, pedibus flavis, abdomine flavo-fasciato.

Female. Length 6 lines. Black: head and thorax strongly punctured; the clypeus, and an ovate spot above, from which a narrow line runs up to the anterior ocellus, the sinus of the eyes, a stripe behind them and the scape in front, yellow; the flagellum fulvous beneath; the tips of the mandibles ferruginous. Thorax elongate; the prothorax in front, the tegulæ, two spots on the scutellum, and the metathorax, yellow; a longitudinal black line in the middle of the latter; a yellow spot beneath the wings and an oblique line behind it; the legs yellow; the wings very large, subhyaline and iridescent; the nervures towards the base of the wings fusco-ferruginous, towards their apex they are pale testaceous; the costal and externo-medial cells with a slight fuscous cloud; a dark cloud occupying the apical half of the marginal cell and passing on to the apex of the wings. Abdomen: the basal segment campanulate, the apical margins of the segments with yellow fasciæ.

Hab. Borneo (Sarawak).

This species belongs to the subgenus *Symmorphus*.

Group **SOCIAL WASPS.**Fam. **VESPIDÆ.**Gen. **ISCHNOGASTER**, *Guérin*.

1. *Ischnogaster cilipennis*, *Smith, Cat. Hym.* pt. v.

Hab. Borneo (Sarawak). Malacca (Mount Ophir).

2. *Ischnogaster Mellyi*, *Ann. Soc. Ent. Fr.* 2^e sér. x. p. 25. pl. 2. f. 1.

Hab. Malacca. Sarawak.

3. **ISCHNOGASTER NIGRIFRONS.** *I. niger*, subtus flavo-variegatus, cellulis primo secundoque submarginalibus æquis, tertia breviori et ad cellulam marginalem angustata.

Female. Length 6 lines. Black: the face and clypeus covered with pale golden pubescence, the colour changing in different lights; the clypeus produced at its apex into an acute spine; the scape in front, the flagellum beneath, the palpi and mandibles, yellow, the latter ferruginous at their apex. Thorax globose; the posterior margin of the prothorax, two oblique lines on the mesothorax anteriorly, a spot on each side of the scutellum, the post-scutellum, and two spots at the apex of the metathorax close to the insertion of the petiole, yellow; beneath, fusco-ferruginous; the legs rufo-piceous, with the knees and the anterior and intermediate tibiæ outside, yellow. Abdomen obscurely rufo-fusca; the first segment petiolated; beneath, with two lines at the base of the node of the petiole; the extreme lateral margins of the first segment, two oblique ones towards its apex beneath, an ovate spot on each side of the two following segments beneath, and the extreme lateral basal margin of the second segment above, yellow.

Hab. Borneo (Sarawak).

4. *Ischnogaster micans*, *Sauss. Mon. Guêpes, Soc.* p. 8.

Hab. Borneo (Sarawak). Malacca.

Gen. **POLISTES**, *Latr.*

Polistes sagittarius, *Sauss. Mon. Guêpes, Soc.* p. 56.

Hab. Borneo (Sarawak). India. China. Greece.

There is probably no species of this genus which is so widely distributed as the present; the specimens which I have seen from Borneo are all smaller than the Indian ones, and are more highly coloured; the mesothorax has a central longitudinal ferruginous stripe, and the metathorax two longitudinal ones.

Gen. **POLYBIA**, *Sauss.*

1. *Polybia Sumatrensis*, *Sauss. Suppl. Guêpes, Soc.*

Hab. Sumatra. Borneo (Sarawak). Malacca.

2. *POLYBIA STIGMA*. *P. nigra*, flavo-variegata, alis anticis hyalinis, margine anteo obscurato, stigmatе flavo.

Male. Length 5 lines. Black : the clypeus and cheeks with a silvery pubescence ; the mandibles, clypeus, sinus of the eyes, the antennæ beneath, and the cheeks, yellow. Thorax : the anterior margin of the prothorax, the tegulæ and a line beneath the wings, a broad oblique stripe on the sides of the metathorax, the scutellum, post-scutellum, and an oblong-quadrant spot beneath it, and also the legs, yellow ; the femora and tibiæ slightly fuscous behind ; the anterior wings with a dark spot at the apex of the externo-medial cell ; the stigma honey-yellow, with a dark stripe beyond it at the margin of the wing. Abdomen : an ovate spot on each side of the second segment at its base, and a yellow fascia on the apical margin ; the extreme apex of the abdomen yellow ; the fascia on the second segment, continued beneath, and two ovate maculæ at its base.

Hab. Borneo (Sarawak).

This is probably the male of *P. decorata*.

3. *POLYBIA LUCTUOSA*. *P. opaca*, nigra, clypei margine anteo flavo, segmentis primo tertio quartoque abdominis flavo-marginatis, alis apice nigro uni-maculatis.

Female. Length $5\frac{1}{4}$ lines. Black : the anterior margin of the clypeus, slightly interrupted in the middle, and a very narrow line at the inner orbits of the eyes, not entering the sinus, yellow ; the head and thorax opaque ; wings hyaline, with a black spot on the anterior margin of the superior pair, near their apex. Abdomen : a narrow yellow fascia on the apical margins of the first, third and fourth segments, the extreme apex yellow.

Hab. Borneo (Sarawak).

4. *POLYBIA DECORATA*. *P. nigra*, flavo multidecorata, pedibus flavis.

Female. Length 5 lines. Black : the clypeus, mandibles, antennæ beneath, the sides of the face and sinus of the eyes, a spot above the clypeus running up into a point as high as the anterior ocellus, and two minute spots on the margin of the vertex, yellow. Thorax : the anterior margin of the prothorax, the tegulæ, and a large broad oblique spot beneath the wings, two longitudinal lines on the mesothorax, the scutellum and post-scutellum, the metathorax and legs, yellow ; the scutellum and metathorax with a longitudinal black line down the middle ; the wings subhyaline, with a fuscous cloud in the marginal cell ; the tibiæ outside, and the tarsi above, slightly fuscous. Abdomen : the first segment campanulate, with a yellow spot on each side at its apex ; the second segment with two very large spots at its base occupying nearly half the length of the segment, and nearly uniting its apical margin as well as those of the three following, with a marginal fascia, yellow ; the apical segment entirely yellow ; beneath

yellow, with only the apical margins of the segments narrowly fuscous.

Hab. Borneo (Sarawak).

Gen. ICARIA, *Saussure*.

1. *Icaria opulenta*, *Smith, Cat. Hym.* pt. v. p. 99. ♀.

The male of this species has been received from Borneo since I described the female, from which it only differs in having the clypeus and mandibles entirely black; in other respects they agree.

2. *Icaria speciosa*, *Sauss. Rev. Zool. (Guérin, 1855)* p. 374.

Hab. Borneo. Malacca. Sumatra.

3. *Icaria ferruginea*, *Fabr.*

Polistes ferruginea, *Fabr. Syst. Piez.* p. 277.

Hab. Malacca (Mount Ophir). India.

4. ICARIA LUGUBRIS. *I. opaea nigra* pube sericea variabili vestita, alis subhyalinis, apice nigro subnebulosis.

Female. Length 6 lines. Black: covered with a fine changeable white silky pile; head opaque, delicately roughened; the clypeus angular in front and with a broad white margin, smooth and shining anteriorly; the mandibles smooth and shining, with a white spot at their base. Thorax finely rugose; the sides of the prothorax, the scutellum and post-scutellum, very obscurely tinged more or less with ferruginous, sometimes not observable; the wings subhyaline, with a dark brown stain at the apex of the externo-medial cell, a similar stain occupies the marginal cell, and a paler cloud descends from it across the apex of the wing. Abdomen: the apex of the petiole and the apical margins of the third and following segments very indistinctly tinged with ferruginous, generally black; the third and following segments densely covered with silky pile.

In my Catalogue of Vespidae, I have indicated this species as being a black variety of *I. speciosa*; I had only one or two examples at that time for examination; but having now a series, I am satisfied of their being distinct: in *I. speciosa* the first segment of the abdomen is as broad as long, in the present it is longer than broad.

Hab. Borneo (Sarawak).

5. ICARIA MODESTA. *I. nigra*, alis fulvo-hyalinis, abdomine ferrugineo.

Female. Length 5 lines. Black: the head and thorax roughly punctured; the face and cheeks with short griseous pubescence; the clypeus angular in front, produced into an acute point. Thorax: the posterior margin of the prothorax ferruginous in the middle; the apical joints of the tarsi ferruginous; wings fulvo-hyaline, the ner-

vures dark ferruginous towards the base of the wings, and pale ferruginous towards their apex. Abdomen dark ferruginous, somewhat obscure; the first segment and base of the second bright red; the sides and the apex of the abdomen with a fine silky white pile.

Hab. Borneo (Sarawak).

Gen. *VESPA*, *Linn.*

1. *Vespa cineta*, *Fabr. Syst. Piez.* p. 254.

Hab. Borneo (Sarawak). Malacca (Mount Ophir).

2. *Vespa affinis*, *Fabr. Syst. Piez.* p. 254 (var. *V. cineta*?).

Hab. Malacca.

3. *Vespa tyrannica*, *Smith, Cat. Hym.* pt. 5. p. 119.

Hab. Singapore.

4. *Vespa* (anomala) *dorylloides*, *Sauss. Mon. Guêpes, Soc.* p. 112.

Hab. Borneo (Sarawak). Malacca. Singapore.

5. *Vespa bellicosa*, *Sauss. Mon. Guêpes, Soc.* p. 146.

Hab. Borneo (Sarawak).

6. *VESPA ANNULATA*. *V. nigra*, scutello flavo-maculato, post-scutello metathoracæque flavis, illo in summo nigro, segmentis tenuibus flavo marginatis.

Worker. Length 10 lines. The clypeus emarginate in front, its lateral angles acute and slightly produced; an elongate-quadrate black spot in the middle not extending to the anterior margin; the cheeks, mandibles, clypeus, a coronet-shaped spot above, the emargination of the eyes, the scape in front and the flagellum beneath, yellow. Thorax: a narrow line on the anterior and posterior margins of the prothorax, the tegulæ and a spot beneath the wings, an ovate spot on each side of the scutellum, the post-scutellum and metathorax, yellow; wings subhyaline, with a narrow fuscous stain at the anterior margin of the superior pair; legs yellow, with a fuscous stain on the tibiæ and femora above. Abdomen: two large spots at the base of the first segment, and a narrow fascia on the apical margins of all the segments, yellow; the yellow bands abruptly widened laterally; the abdomen yellow beneath, with the base of the segments blackish.

Hab. Borneo (Sarawak). Malacca.

Fam. *TENTHREDINIDÆ*, *Leach.*

1. *TENTHREDO COXALIS*. *T. chalybea*, clypeo palpis trochanteribus coxarum apicibus tibiisque postice albis, alis hyalinis.

Female. Length 4 lines. Steel-blue; the antennæ black; the clypeus and palpi white. Thorax: a line before and a spot beneath the tegulæ,

the trochanters, apex of the coxæ, the knees and the tibiae behind, white; the wings hyaline and iridescent; the nervures and stigma dark brown; two minute white spots on the post-scutellum; the extreme apex of the abdomen with a white spot.

Hab. Singapore.

Gen. TREMEX, *Jurine*.

1. TREMEX INSULARIS. *T. ater*, capite thorace disco viridibus, abdomine et thorace flavo-variegatis, alis subhyalinis, margine antio fuscis.

Female. Length 8 lines. Head brassy-green, strongly punctured; the antennæ black with the apical joints yellow; the face thinly covered with white pubescence. Thorax: the disk and the scutellum with a green tinge; the pro- and metathorax above yellow; the segments of the abdomen have each a yellow fascia, the first two slightly interrupted, the terminal segment with an oblique yellow stripe on each side; the tibiae yellow, the tarsi ferruginous; the base of the abdomen yellow beneath; the wings subhyaline, a dark fuscous stain along the anterior margin of the superior pair, the apical margins of both wings fuscous.

Hab. Borneo (Sarawak).

Fam. CYNIPIDÆ, *Westw.*

1. CYNIPS INSIGNIS. *C. flavo-ferruginea*, antennis fuscis, alis flavo-hyalinis apice fuscis.

Female. Length $4\frac{1}{2}$ lines. Reddish-yellow, smooth and shining, rather paler beneath; the flagellum slightly fuscous, with the base and apex pale; tips of the mandibles black; the mesothorax deeply and transversely grooved; the base of the wings flavo-hyaline; from the base of the stigma to the apex dark fuscous; the insect is thinly covered with a short pale pubescence; the ovipositor black; the sheath and the claws dark ferruginous.

Hab. Borneo (Sarawak).

Fam. ICHNEUMONIDÆ, *Leach*.

1. ICHNEUMON PENETRANS. *I. niger*, capite thoraceque flavo variegatis, pedibus flavis nigro-maculatis, abdominis annulis flavo-marginatis.

Female. Length 8 lines. Black: the face below the insertion of the antennæ, the labrum, mandibles, palpi, cheek, inner orbits of the eyes, and the antennæ, yellow; the scape and base and apex of the flagellum black: a black spot above the clypeus, and the apex of the mandibles ferruginous. Thorax: the lateral margins of the prothorax, a

spot on the tegulæ, two longitudinal spots on the mesothorax, the scutellum, post-scutellum, two spots on the metathorax behind and a line at the sides, two oblique maculæ on the sides of the thorax and the legs, yellow; the anterior and intermediate legs with a fuscous line outside; the posterior femora and the apex of the tibiæ black; wings hyaline. Abdomen: the base of the petiole and its apical margin yellow; the base of the first segment and the apical margins of all the segments with a yellow fascia; beneath entirely yellow.

Hab. Borneo (Sarawak).

2. *ICHNEUMON COMISSATOR*. *I. niger*, antennis medio albis, thorace pedibusque flavo variegatis, abdominis petioli basi marginibus basilibus segmentorum trium sequentium duobusque segmentis apicalibus flavis.

Male. Length 7 lines. Black: antennæ white in the middle; the head is yellow, except the hinder part of the vertex, and a black stripe running from the vertex to the insertion of the antennæ. The prothorax has the anterior and posterior margins yellow; the tegulæ, two spots on the disk of the mesothorax, the scutellum and post-scutellum, and metathorax, yellow; a black spot on the tegulæ, another on the scutellum, and a black T-shaped mark on the metathorax; the thorax with yellow maculæ on the sides, and the legs yellow; the anterior and intermediate legs with a black line outside, and the posterior femora and apex of the tibiæ black. The petiole of the abdomen yellow, with a black macula at its apex; the first, second and third segments with a broad, deeply emarginate fascia at their base; the two apical segments entirely yellow.

Hab. Borneo (Sarawak).

GEN. *CRYPTUS*, *Fabr.*

1. *CRYPTUS CROCEIPES*. *C. niger*, metathorace bispinoso, antennis medio tarsisque posticis et abdomine apice albis, pedibus flavis.

Female. Length 5 lines. Black: subopake, with the apex of the abdomen white above; the middle of the antennæ, above, white about one-third of their length; the legs yellow; the posterior tibiæ and claw-joint of the tarsi, and also the anterior tarsi, fuscous; the posterior tarsi white; the wings hyaline and iridescent, with a faint cloud at the apex of the first submarginal cell, the stigma and nervures, black; the metathorax armed with two short spines which are white at their tips.

Hab. Borneo (Sarawak).

2. *CRYPTUS ELEGANS*. *C. niger*, antennis medio scutelloque et abdominis apice albis, alis hyalinis macula fusca ad apicem, abdominis fasciis albis, thorace bispinoso.

Female. Length $4\frac{1}{2}$ lines. Black: the scape pale rufo-testaceous, the apical half of the flagellum and the palpi white; the apex of the flagellum, and the outside of the white portion, fuscous. The tegulae, scutellum, a line on the post-scutellum, and the posterior tarsi, white; the legs pale rufo-testaceous; the metathorax rugose and armed with two white spines; the wings hyaline, with a fuscous stain descending from the stigma to the inferior margin of the discoidal cell. Abdomen: the basal segment rufo-testaceous at the base and white at its apical margin; the second segment black at its base, then rufo-testaceous, becoming white at its apical margin; the apex of the abdomen white.

Hab. Borneo (Sarawak).

3. *CRYPTUS LEPIDUS.* *C. niger*, alis hyalinis, tarsis posterioribus albo-, metathorace transverso-striatis, abdominis apice albo.

Female. Length 6 lines. Black; shining; antennae white in the middle; the wings hyaline, the nervures black; the anterior and intermediate legs, and the posterior coxae, reddish-yellow; the anterior and intermediate tarsi fuscous, the posterior pair white; the three apical segments white above; the posterior margins of the second and third segments with very narrow white fasciae; the metathorax transversely striated.

Hab. Borneo (Sarawak).

GEN. PIMPLA, *Fabr.*

1. *Pimpla punetator.*

Ichneumon punctator, *Linn. Syst. Nat.* i. 935. 38.

Pimpla pedator, *Fabr. Syst. Piez.* p. 114. 6.

Hab. India. Borneo (Sarawak).

GEN. MEGAPROCTUS, *Brullé.*

1. *MEGAPROCTUS RUFICEPS.* *M. niger*, capite ferrugineo, thorace abdominisque segmento primo et secundo rugosis, alis hyalinis, tarsis posterioribus albis.

Female. Length 8 lines. Head and scape of the antennae ferruginous, smooth and shining; the flagellum and tips of the mandibles black. Thorax opaque black, rugose, but not coarsely so; the mesothorax convex in front, sub-bituberculate, the tubercles obsoletely ferruginous; the wings hyaline, the nervures black; the base of the tibiae, the apex of the first and second joints of the anterior tarsi, the third and fourth entirely, the intermediate pair wanting, and the posterior pair, white; the claw-joint of the latter black. Abdomen opaque black, broad at the base and slightly widening to the apex; the first segment and a large angular shape in the middle of the second with large close punctures; on each side of the angular shape it is longi-

tudinally rugulose; the apical segments smooth and shining; the ovipositor a little longer than the insect.

Hab. Singapore.

Gen. RHYSSA, *Grav.*

1. RHYSSA MIRABILIS. *R.* capite thorace pedibus anticis et intermediis sanguineo-rubris, coxis intermediis antice posticeisque a tergo, albis, alis fuscis, abdomine basi nigro sensim ad apicem pallidiore, apice flavescenti-albo, ovipositore elongato.

Female. Length 13 lines. Head, thorax and anterior legs ferruginous; the mandibles black; wings dark fuscous, with a coppery effluence; the intermediate and posterior legs dark rufo-piceous; the intermediate coxæ in front and the posterior pair behind, white; the intermediate tibiæ ferruginous in front, the tarsi fuscous; the apex of the metathorax above black, smooth and shining. Abdomen smooth and shining, black at the base, and gradually becoming paler to the apex, which is pale yellowish-white; the apical segments deeply emarginate in the middle above; the ovipositor one-third longer than the body.

Hab. Borneo (Sarawak).

2. RHYSSA MACULIPENNIS. *R.* nigra, flavo dense maculata, alis anticis macula magna fusca ad apicem.

Female. Length 10 lines. Black: the face, inner and outer orbits of the eyes, and a spot on the scape in front, yellow. Thorax: the posterior margin of the prothorax, the tegulæ and two spots beneath the wings, the scutellum and a minute spot on each side, at its anterior angles, a spot on the post-scutellum, a trilobate spot on the metathorax, in the middle, and a large irregular macula at the sides, yellow; the legs yellow; the tarsi fuscous; the anterior coxæ behind and the femora and tibiæ outside with a rufo-piceous stain, the intermediate and posterior black and spotted with yellow, the femora black above, the tibiæ fuscous at their base behind; the wings hyaline, with a faint yellow tinge, the nervures black, the stigma ferruginous; a large dark brown macula on the anterior wings placed at the apex of the stigma. Abdomen: a longitudinal yellow spot in the middle of the two basal segments, and an oblique ovate yellow spot at the sides of the three following segments towards their apical margins: the ovipositor one-fourth longer than the body.

Hab. Borneo (Sarawak). Singapore.

Gen. MEGISCHUS, *Brullé.*

1. MEGISCHUS INSULARIS. *M.* niger, capite ferrugineo, thorace abdominisque segmento primo rugosis, alis subhyalinis, ovipositore ad apicem albo annulato.

Female. Length 10 lines. Black: the head red, coarsely rugose, having three or four deep transverse curved grooves above the ocelli, in front

of which is a triangular shallow cavity which has several radiating carinae; the corners of the triangle raised and recurved; the antennae and palpi black. Thorax coarsely rugose, having a mixture of transverse sculpturing and large shallow punctures; wings fusco-hyaline, with the nervures black, a slight fuscous cloud in the first discoidal cell; the posterior margin of the prothorax narrowly pale testaceous; the posterior coxæ transversely rugose-striate; the posterior femora incrassate, denticulate beneath. Abdomen: the first segment transversely striated, the following smooth and shining; the ovipositor a little shorter than the body.

Male. About the same size as the female, similarly coloured and sculptured; the posterior femora similarly denticulate; the first segment of the abdomen more finely striated, the apical margins of the third and three following segments notched in the middle.

Hab. Sarawak.

Gen. MACROGASTER, *Brullé*.

1. MACROGASTER FLAVO-PICTUS. *M.* nigro flavoque varius, alis anticis macula magna nigro-fusca ad apicem.

Female. Length 15 lines. Head black; the face, cheeks, mandibles, and scape in front, yellow. Thorax black, transversely rugose; the posterior margin of the prothorax, a small and a large spot beneath the wings, the legs and breast in front, four spots on the mesothorax, a spot on the scutellum and a smaller one at each side, the tegulae, and the base and sides of the metathorax, yellow; the wings hyaline; the nervures black; the stigma yellow; a large dark fuscous macula at the apex of the marginal cell extending across the second submarginal cell. Abdomen black and subopaque, with the apical margins of the segments smooth and shining; each segment with a yellow fascia before its apical margin, the two basal fasciae widest in the middle, the four following narrowest in the middle, or the two last slightly interrupted; the ovipositor twice the length of the insect.

Hab. Singapore.

This species may possibly be a *Rhyssa* with the petiolated submarginal cell obsolete; the neururation of the wing agrees with that of Brullé's genus *Macrogaster*. I am not acquainted with any other genus to which it could belong; the antennae are those of *Rhyssa*, not apparently of *Macrogaster*.

Gen. OPHION, *Fabr.*

1. OPHION IRIDIPENNIS. *O.* rufo-ferrugineus, capite postico flavo, abdomine fusco basi ferrugineo, metathorace rugoso.

Female. Length 10 lines. Reddish-yellow; the eyes distinctly emarginate; the face smooth and shining, slightly convex; the tips of the mandibles black; the head yellow behind. Thorax: the mesothorax smooth and shining, with a central longitudinal fuscous stripe; the metathorax coarsely transversely rugose, with a series of short longi-

tudinal striæ at the base; wings hyaline and splendidly iridescent, the nervures ferruginous, with the costal nervure and stigma much darker. Abdomen fuscous, with the first, second, and base of the third segments ferruginous.

Hab. Borneo (Sarawak).

2. *OPHION VESTIGATOR*. *O. rufo-testaceus*, abdomine apice fusco, metathorace subrugoso.

Female. Length 10 lines. Pale rufo-testaceous: eyes deeply emarginate; wings hyaline and iridescent, the nervures fusco-ferruginous; the meso- and metathorax rugose; the four apical segments of the abdomen fuscous and covered with short cinereous pubescence.

Hab. Malacca.

Gen. *XYLONOMUS*, *Grav.*

1. *XYLONOMUS FULGIDIPENNIS*. *X. opacus*, niger, antennis flavo-annulatis, alis nigris aureo-fulgentibus, abdomine nigro-chalybeo.

Female. Length 14 lines. Black and opaque: antennæ annulated with yellow; the thorax narrowed anteriorly; the metathorax large and wide; the wings dark brown, with a bright coppery effulgence; the tegulæ and two spots at the base of the metathorax obscurely blue. Abdomen blue-black, with bright tints of blue in certain lights.

Hab. Sarawak.

- I have assigned this fine insect to the genus *Xylonomus*, to which it appears to belong; the neuration of the wings and the enlarged metathorax connect it with that genus.

Fam. *BRACONIDÆ*, *Westw.*

Gen. *BRACON*, *Fabr.*

1. *BRACON ACULEATOR*, *Fabr.* *B. ferrugineus*, antennis aculeoque nigris, alis flavescentibus, puncto marginali nigro.

Ichneumon aculeator, *Fabr. Ent. Syst.* ii. 159. 105.

Bracon aculeator, *Fabr. Syst. Piez.* 107. 21.

Hab. Malacca (Mount Ophir). Borneo (Sarawak). Tranquebar.

2. *BRACON QUADRICEPS*. *B. capite thorace pedibus anticis et intermediis coxisque posticis ferrugineis, pedibus posticis et abdomine nigris, alis fuscis basi hyalinis.*

Female. Length $7\frac{1}{2}$ lines. Head, thorax, anterior and intermediate legs, and the posterior coxæ, ferruginous; the head and thorax smooth and shining, the former quadrate; the clypeus deeply emarginate; the scape and first joint of the flagellum ferruginous within; the wings yellow to the apex of the externo-medial cell, beyond which they are fuscous and mottled with a number of semitransparent spots; the base of the stigma reddish-yellow. Abdomen and posterior legs black; the first segment of the abdomen at an oblique angle with the following segments, above, with a central and two lateral carinæ, outside of which it is yellow; the second and third segments longitudi-

nally rugose-striate; the following segments smooth and shining; the ovipositor ferruginous, the sheaths black and very pubescent.

Hab. Borneo (Sarawak).

This species, which has the posterior tarsi thickened and the abdomen angulated at the base, I have little doubt belongs to the genus *Myosoma* of Brullé.

3. *BRACON SUSPICIOSUS*. *B. capite thorace pedibus anticis et intermediis sanguineo-rubris, alis fuscis, abdomine nigro.*

Female. Length 8 lines, of the ovipositor 9 lines. Black: the head, scape of the antennæ, anterior legs, pro- and mesothorax, ferruginous; the head subquadrate, very smooth and shining; the clypeus emarginate its entire width, the tips of the mandibles black. The thorax highly polished above; the wings dark fuscous, with a semi-hyaline streak crossing the lower angle of the first submarginal cell; the posterior tibiæ and tarsi stout. The first segment of the abdomen at right angles with the following segments; the second and third segments longitudinally striated, the following segments smooth and shining.

Hab. Borneo (Sarawak).

This species in all probability belongs to Brullé's genus *Myosoma*.

4. *BRACON INSIGNIS*. *B. capite thorace pedibus anticis et intermediis ferrugineis, metathorace supra nigro, abdomine pedibusque posticis nigris, alis nigro-fuscis, ovipositore corpore quadruplo longiore.*

Female. Length of the body 11 lines, of the ovipositor 44 lines. Head, thorax, anterior and intermediate legs ferruginous; the head and thorax smooth and shining, the antennæ black; the metathorax, posterior legs, and abdomen, black, wings dark fuscous; beneath the first submarginal cell is a minute hyaline spot. Abdomen: the basal segment, and a triangular impressed shape at the base of the second in the middle, longitudinally striated; the second, third, and fourth segments with a rugose striation, radiating from the middle of each segment; the apical segments smooth and shining; the ovipositor ferruginous, the sheaths black and pubescent.

Hab. Borneo (Sarawak).

5. *BRACON CEPHALOTES*. *B. rufescenti-flavus, antennis et ovipositore nigris, alis flavo-hyalinis, macula nigra ad stigmatis basin, alteraque in cellula prima discoidali.*

Female. Length 8 lines. Rufo-flavous; antennæ and tips of the mandibles black; anterior margin of the clypeus entire; head wider than the thorax, quadrate, smooth, and shining. Thorax very smooth, shining; the mesothorax very convex anteriorly, with an oblique depression on each side anteriorly; the wings flavo-hyaline, with a black macula at the base of the stigma, and a smaller one at its apex, a third macula in the first discoidal cell, and an oblong stain beyond it on the margin of the wing; the posterior wings with their apex and inferior margin fuscous; the posterior tarsi slightly fuscous. Abdo-

men smooth and shining, the basal segment with a deep fovea anteriorly, and a convex shape beyond extending to the posterior margin; the two following segments with an oblique depression on each side.

Hab. Borneo (Sarawak).

This species resembles the *B. aculeata*, Fabr., but differs in not having the thorax narrowed anteriorly, and in having an additional spot on the wings; the head is also much larger, and in what I consider to be *B. aculeata*, the two basal joints of the antennæ are pale ferruginous.

6. *BRACON PERPLEXUS*. *B. flavus*, vertice macula triangulari notato, antennis tarsisque posticis et ovipositore nigris, alis fuscis, dimidio basali flavis.

Female. Length 6 lines. Yellow: the vertex with a large triangular shape, which extends to the insertion of the antennæ, the tips of the mandibles and the antennæ, black; the head smooth and shining; the thorax smooth and shining, with the posterior tarsi dusky; wings yellow-hyaline as far as the apex of the externo-medial cell, beyond which they are of a uniform black, not intense in colour, and with an oblong hyaline streak in the first submarginal cell and two ovate ones below; the stigma yellow at the base. Abdomen: the first segment with a central longitudinal convex shape in the middle, which, as well as the two following segments, is longitudinally striated; the ovipositor black.

Hab. Borneo (Sarawak).

7. *BRACON VAGATUS*. *B. capite thorace pedibusque anticis et intermediis ferrugineis, abdomine maculaque metathoracis nigris, alis flavescentibus.*

Female. Length 5 lines. Head, thorax and legs, smooth, shining, ferruginous, the antennæ black, a fuscous spot on the vertex. Thorax smooth and shining; the metathorax black above, and the posterior legs black; the wings flavo-hyaline; a black spot at each end of the stigma; the apex of the posterior wings and the apical portion of the inferior margin of the superior pair, slightly fuscous. Abdomen: the lateral and apical margins of the basal segment, and the apical margins of the third and following segments, yellow; the basal segment with a longitudinal deep lateral channel and a central carina; the second segment rugose, with the apical margin and three triangular spaces at the base, smooth, shining, black; the third segment with an oblique deeply impressed line on each side, the ovipositor black.

Hab. Malacca (Mount Ophir).

8. *BRACON INQUIETUS*. *B. capite thorace pedibusque anticis et intermediis ferrugineis, abdomine alis maculaque metathoracis nigris.*

Female. Length 9 lines. Head, thorax, anterior and intermediate legs, ferruginous; the face with a triangular flattened projecting appendage at the base of the clypeus; the antennæ black, the head quadrate, smooth and shining. Thorax smooth and shining, with a black spot on the metathorax above; the wings and posterior legs black. Ab-

domen finely rugose, the basal segment with two deeply impressed smooth longitudinal channels, the lateral margins yellow, beneath yellow; the ovipositor with its sheaths very pubescent.

Hab. Sarawak.

This species probably belongs to the genus *Myosoma* of Brullé.

9. *BRACON RUGIFRONS*. *B. niger*, capite thorace pedibusque anticis et intermediis ferrugineis, alis nigris.

Female. Length 5 lines. Black: head, thorax, anterior and intermediate legs ferruginous, the scape ferruginous; the thorax and the vertex smooth and shining, the face rugose; the head subquadrate; the thorax much narrowed towards the head; the mesothorax with two longitudinal smooth elongate impressed lines converging towards the scutellum; the wings of a uniform dark fuscous. Abdomen: the three basal segments longitudinally and irregularly striated; the basal segment margined laterally and having a central carina, the second segment with a central and two converging carinae; the third segment with a deep transverse depression, the apical margin smooth and shining; the fourth segment irregularly depressed and striated at the base.

Hab. Borneo (Sarawak).

10. *BRACON FLORALIS*. *B. niger*, capite thorace pedibusque anticis ferrugineis, antennis pedibusque intermediis et posterioribus, alis et abdomine maculaque metathoracis nigris.

Female. Length $6\frac{1}{2}$ lines. Head, scape of the antennae, thorax, anterior and intermediate legs, ferruginous; the head and thorax very smooth and shining; the thorax narrowed anteriorly into a neck; the mesothorax with two elongate converging smooth impressed lines; the metathorax dark rufo-piceous above, with a bright ferruginous line down the centre; the intermediate tibiae and tarsi black; wings dark brown, with a hyaline spot at the inferior angle of the first submarginal cell. Abdomen smooth and shining; the first segment with a deeply impressed channel on each side, and a central impressed line extending from the base half way towards the apex; the second segment with a spear-shaped elevation in the middle of its base, and a lateral deep longitudinal excavation at the sides; the third segment with an oblique impressed line at the sides.

Hab. Borneo (Sarawak).

11. *BRACON VULTUOSUS*. *B.* capite thorace pedibusque anticis ferrugineis, abdomine pedibusque intermediis et posticis, abdomine maculaque metathoracis nigris.

Female. Length 7 lines. Black: head, thorax and anterior legs, the scape and basal joints of the flagellum in front, ferrugineous; the face with a projecting flattened appendage at the base of the clypeus; the scape fringed with black hairs on its inner margin. Thorax smooth and shining; the metathorax obscure, black in the middle and

rufo-piceous at the sides, above; wings fuscous, palest towards their apex, with the stigma yellow; the intermediate legs with the knees ferruginous. Abdomen opaque, finely rugose; the basal segment with a longitudinal striation, a deeply impressed space at the sides, with the extreme lateral margins, yellow; the second segment with a small arrow-headed raised shape in the middle of its base and an oblique impressed line on each side; the two following segments have also oblique impressed lines at the sides; the third and fourth segments with their apical margins straight in the middle and abruptly oblique at the sides.

Hab. Singapore.

12. *BRACON FOVEATUS*. *B. capite thorace pedibusque anticis ferrugineis, alis nigris, ovipositoreque elongato pubescentibus.*

Female. Length 7 lines. Black: head, thorax, scape in front and the anterior legs, ferruginous; the face punctured, the thorax smooth and shining; the mesothorax with two converging longitudinal depressions extending to the scutellum; the wings dark fuscous; the intermediate tibiae at their apex in front obscurely ferruginous. Abdomen: the four basal segments longitudinally rugose; the basal segment with a longitudinal smooth shining depression on each side; the second segment with two triangular smooth depressions and a longitudinal one on each side running onwards and terminating in a large fovea; the third and fourth segments with a smooth shining fovea on each side, the fifth and sixth segments smooth and shining; the ovipositor more than twice the length of the insect, and very pubescent.

Hab. Singapore.

13. *BRACON LABORIOSUS*. *B. capite thoraceque flavo-variegatis, pedibus anterioribus et intermediis flavis, abdomine annulis flavo-marginatis.*

Female. Length 7 lines. Black: the face, mandibles and cheeks, of a reddish-yellow; a black triangular spot in the middle of the face. Thorax shining, much narrower towards the head; a line before the tegulae uniting with a large spot beneath the wings, a transverse space between the posterior wings, the metathorax above, the tegulae and legs, yellow; a transverse black patch at the base of the metathorax with a line running backwards from each extremity; the posterior legs black with the knees yellow; the wings yellowish-hyaline, the nervures pale ferruginous, the apex of the wing slightly fuscous, a black spot at the base of the first submarginal cell, the stigma pale ferruginous. Abdomen: the basal segment yellow, with a shining black spot in the middle; the apical margins of the four following segments yellow; the abdomen yellow beneath, with an elongate black line on each side of the segments.

Hab. Borneo (Sarawak).

14. *BRACON CRASSIPES*. *B. capite thorace pedibusque anticis ferrugineis,*

metathorace supra nigro-piceo, abdomine pedibusque intermediis et posticis nigris, alis hyalinis basi fuscis.

Female. Length 8 lines. Head smooth and shining; antennæ and tips of the mandibles black; clypeus deeply emarginate. Thorax: much narrowed towards the head, smooth and shining; the wings subhyaline, the posterior pair fuscous towards the base, the superior pair yellowish, the nervures pale ferruginous, the costal nervures dark ferruginous, the stigma pale; the legs thick, particularly the posterior pair, the intermediate tibiæ ferruginous at the base. Abdomen: the basal segment at right angles with the following segments; the base of the second segment with an impressed oblique line on each side, and a central carina, each extending to about the middle of the segment; all the segments of an opaque black, and margined posteriorly; the margin of the second segment curved and strongly crenulated, the abdomen yellow beneath.

Hab. Singapore.

Gen. AGATHIS, *Latr.*

1. *Agathis flavipennis*, *Brullé, Hym. iv. p. 484. 3.*

Hab. Singapore. India.

Gen. MICRODUS, *Esenbeck.*

1. *MICRODUS APICALIS.* *M.* capite thorace pedibusque anticis et intermediis pallide ferrugineis, abdomine pedibusque posticis, mesothorace trimaculati et metathorace supra nigris, alis flavescens apice fuscis.

Female. Length $5\frac{1}{2}$ lines. Head and thorax pale red; the antennæ, a spot enclosing the ocelli and the eyes, black. Thorax: the mesothorax divided into three elevations by two oblique converging deeply impressed lines, each division with a black stripe in the middle; wings yellow, fuscous beyond the apex of the stigma, the fuscous cloud inclining inwards and crossing both wings. Abdomen: the three basal segments longitudinally striated; their lateral margins and the apical margin of the basal segment, yellow; the abdomen yellow beneath. The ovipositor about the length of the insect.

Hab. Singapore.

Fam. CHALCIDIDÆ, *Walker.*

Gen. EPISTENIA, *Westwood.*

1. *EPISTENIA IMPERIALIS.* *E.* capite thoraceque purpureis rude punctatis, alis hyalinis, abdomine versicolori, segmentis apicalibus basi testaceis.

Female. Length $7\frac{1}{2}$ lines. Head and thorax of a rich purple, the metathorax with tints of bright green; the legs black, the apex of the joints rufo-piceous as well as the apical joints of the tarsi. Abdomen: of

changeable hues, partaking of tints of blue, purple, violet or green, in different lights; the three basal segments deeply emarginate above, with central longitudinal depressions extending to their base; the ovipositor thick and pubescent, two-thirds of the length of the abdomen.

Hab. Borneo (Sarawak).

This beautiful insect appears to belong to the genus *Epistenia*, established by Westwood in Griffith's 'Animal Kingdom;' if not so, it is very closely allied.

Fam. CHRYSIDIDÆ, *Leach.*

Gen. HEDYCHRUM, *Latr.*

1. HEDYCHRUM ORIENTALE. *H. viridi-cyanæum*, capite thoraceque confertissime punctulatis, abdominis segmenti tertii margine apicali arcuato integerrimo, alis subhyalinis.

Length $2\frac{1}{2}$ lines. The head and thorax very coarsely punctured, the abdomen more delicately so; the abdomen of a bright green, with blue tints in different lights, the flagellum fusco-testaceous, the mandibles ferruginous at their apex; the deep concavity of the face, in which the scape rests in repose, delicately transversely striate; the tooth at the lateral angles of the metathorax acute; the abdomen nigro-æneous beneath, with a thin, short, glittering pale pubescence, the apical segment widely emarginate.

Hab. Singapore.

Gen. CHRYSIS, *Linn.*

2. CHRYSIS MALACHITICA. *C. crassissime punctata viridi-cyanæa*, thorace viridi-aureo, alis fusco-hyalinis, abdominis segmentis apicalibus dentibus sex armatis.

Length $4\frac{1}{2}$ lines. Metallic green, splashed with gold on the thorax and sides of the abdomen; the flagellum, mandibles, and tarsi black; the hinder margin of the vertex tinged with blue. The disk of the thorax blue; the tegulæ and nervures of the wings with a purple tinge; the wings subhyaline and iridescent; the lateral posterior angles of the metathorax acute; the post-scutellum produced, the apex truncate. Abdomen: more finely punctured than the head and thorax, but most strongly so at the base; the basal margin with a deep excavation on each side, the lateral angles somewhat produced and obtuse; the basal margin of the second segment blue; the apical margin of the third segment armed with six acute teeth.

Hab. Borneo (Sarawak).

3. CHRYSIS VESTIGATOR. *C. viridis nitens purpureo variegata*, punctatissima, abdominis segmentis margine basali nigro-æneis, ano tridenticulato.

Length $3\frac{3}{4}$ lines. Green, with shades and spots of deep blue; the tarsi, flagellum and mandibles, black; the head and thorax coarsely and

deeply punctured, the abdomen more finely so; one or two of the basal joints of the flagellum green above; the region of the ocelli blue. Thorax: a transverse blue line in the middle of the prothorax; the mesothorax with an oblong-quadrate blue shape in the middle; the wings subhyaline with the nervures brown. The abdomen with a central longitudinal smooth line; the middle of the abdomen tinged with rich blue; the apex distinctly tridentate.

The valuable collection of *Hymenoptera* which I have described, and, by permission of the Society, have had the pleasure of laying before them, is the property of W. W. Saunders, Esq., Fellow of the Society, and is the most complete collection formed by Mr. Wallace. In addition to the interest attached to the description of new species, I have endeavoured to show the extent of the known geographical range of those already described. Of the family *Apidae*, forty-one species are enumerated, twenty-six of which are new. It is, however, to the *Formicidæ* that the most valuable additions are made: of the eighty-five species collected, only seven have been previously described; ten are added to the *Mutillidæ*, forty-one to the Fossorial group, and thirteen to the family *Vespidæ*. This enumeration will serve to give some idea of the valuable additions to science, resulting from the labours of Mr. Wallace, in collecting the insects of the Eastern Archipelago.

DESCRIPTION OF THE PLATES.

TAB. I.

Fig.

1. Tongue of *Ptenoplectra chalybea*. 1 a, labial palpi; 1 b, paraglossæ; 1 c, labium.
2. The maxilla of *Ptenoplectra chalybea*. 2 a, maxillary palpus.
3. The posterior leg of *Ptenoplectra*.
4. Calcar or spur on the posterior tibia of *Ptenoplectra*.
5. Anterior wing of *Ptenoplectra*.
6. *Myrmica longipes*, ♀.
7. The labial palpi of *Polyrhachis*.
8. Maxillary palpi of *Polyrhachis*.
9. Thorax and abdomen of *Polyrhachis bihamata*.
10. Labial palpi of *Heptacondylus*. 11. Maxillary palpi of the same.
12. Wing of the same. 13. Profile of the same. 14. Antennæ of the same.
15. Profile of *Physatta*. 16. Labial palpi of the same. 17. Maxillary palpi of the same. 18. Wing of the same. 19. Antennæ of the same.

Fig.

20. *Cerapachys oculatus*. 21. Head of the same. 22. Wing of the same.
 23. Antennæ of the same. 24. Abdomen of the same.
 25. *Echinopla melanarctos*. 26. Section of the abdomen of the same,
 showing the styles, or blunt spines, with hairs on their summits,
 which cover the abdomen above. 27. Maxillary palpus of the same.
 28. Mandible of the same. 29. Labial palpus of the same.

TAB. II.

1. *Myrmosida paradoxa*. 1 a, antennæ; 1 b, wing.
2. *Crematogaster inflata*. 1 b, wing; 1 c, mandible.
3. *Cataulacus horridus*.
4. *Cataulacus insularis*. 4 a, anterior wing.
5. *Meranoplus cordatus*. 6. *Meranoplus macronotus*.
7. *Meranoplus castaneus*. 8. *Cataulacus reticulatus*.
9. Tongue of *Gayella pulchella*. 9 a, labial palpi; 9 b, paraglossæ. 10.
 Maxilla. 10 a, maxillary palpi.
11. Anterior wing of *Gayella pulchella*.

On the general Geographical Distribution of the Members of the
 Class AVES. By PHILIP LUTLEY SCLATER, Esq., M.A.,
 F.L.S.

[Read June 16th, 1857.]

AN important problem in Natural History, and one that has hitherto been too little agitated, is that of ascertaining the most natural primary divisions of the earth's surface, taking the amount of similarity or dissimilarity of organized life solely as our guide. It is a well-known and universally acknowledged fact that we can choose two portions of the globe of which the respective Faunæ and Floræ shall be so different, that we should not be far wrong in supposing them to have been the result of distinct creations. Assuming then that there are, or may be, more areas of creation than one, the question naturally arises, how many of them are there, and what are their respective extents and boundaries, or in other words, what are the most natural primary ontological divisions of the earth's surface?

In the Physical Atlases lately published, which have deservedly attracted no small share of attention on the part of the public, too little regard appears to have been paid to the fact that the divisions of the earth's surface usually employed are not always those

which are most natural when their respective Faunæ and Floræ are taken into consideration. The world is mapped out into so many portions, according to latitude and longitude, and an attempt is made to give the principal distinguishing characteristics of the Fauna and Flora of each of these divisions; but little or no attention is given to the fact that two or more of these geographical divisions may have much closer relations to each other than to any third, and, due regard being paid to the general aspect of their Zoology and Botany, only form one natural province or kingdom (as it may perhaps be termed), equivalent in value to that third. Thus in 'Johnston's Physical Atlas,' the earth is separated into sixteen provinces for Ornithology, solely according to latitude and longitude, and not after ascertainment of the amount of difference of ornithic life in the respective divisions. Six of these provinces are appropriated to America, one to Europe, and six to Asia, Australia, and the islands; a very erroneous division, according to my ideas, as I shall hereafter attempt to show. In Mr. Swainson's article in Murray's 'Encyclopedia of Geography,' and in Agassiz's introduction to Nott and Gliddon's 'Types of Mankind,' what I consider to be a much more philosophical view of this subject is taken. The latter author, in particular, attempts to show that the principal divisions of the earth's surface, taking zoology for our guide, correspond in number and extent with the areas occupied by what Messrs. Nott and Gliddon consider to be the principal varieties of mankind. The argument to be deduced from this theory, if it could be satisfactorily established, would of course be very adverse to the idea of the original unity of the human race, which is still strongly supported by many Ethnologists in this country. But I suppose few philosophical zoologists, who have paid attention to the general laws of the distribution of organic life, would now-a-days deny that, as a general rule, every species of animal must have been created within and over the geographic area which it now occupies. Such being the case, if it can be shown that the areas occupied by the primary varieties of mankind correspond with the primary zoological provinces of the globe, it would be an inevitable deduction, that these varieties of Man had their origin in the different parts of the world where they are now found, and the awkward necessity of supposing the introduction of the red man into America by Behring's Straits, and of colonizing Polynesia by stray pairs of Malays floating over the water like cocoa-nuts, and all similar hypotheses, would be avoided.

But the fact is, we require a far more extended knowledge

of zoology and botany than we as yet possess, before it can be told with certainty what *are* the primary ontological divisions of the globe. We want far more correct information concerning the families, genera, and species of created beings—their exact localities, and the geographical areas over which they extend—before very satisfactory conclusions can be arrived at on this point. In fact, not only families, genera, and species, but even local varieties must be fully worked out in order to accomplish the perfect solution of the problem. There is no reason, however, why attempts should not be made to solve the question, even from our present imperfect data, and I think the most likely way to make good progress in this direction, is for each inquirer to take up the subject with which he is best acquainted, and to work out what he conceives to be the most natural divisions of the earth's surface from that alone. Such being done, we shall see how far the results correspond, and on combining the whole, may possibly arrive at a correct solution of the problem—to find the *primary ontological divisions of the earth's surface*.

With these views, taking only the second group of the Order Vertebrata, the Class *Aves*, I shall attempt to point out what I consider to be the most natural division of the earth's surface into primary kingdoms or provinces, looking only to the geographical distribution of the families, genera, and species of this class of beings.

Birds, being of all the animated creation the class most particularly adapted for wide and rapid locomotion, would, at first sight, seem to be by no means a favourable part of Nature's subjects for the solution of such a problem. But, in fact, we know that there are many species, genera, and even families of this class, particularly amongst the *Passeres*, whose distribution is extremely local. The *Nestor productus*, confined to the little island called Philip Island; the several genera of Finches peculiar to the archipelago of the Galapagos; the gorgeous family *Paradisæidæ*, restricted to the Papuan territory, are familiar examples of this fact. Again, the migratory birds which traverse large districts of the earth's surface, how constant are they in returning only where they have been in former years! We do not find that the Nightingale extends its range farther to the west one year than another, nor that birds looked upon as occasional visitors to this country, grow more or less frequent. If the contrary be the case, it may always be accounted for by some external cause, generally referable to the agency of *man*, and not to any change in Na-

ture's unvarying laws of distribution. It is, however, amongst the *Passeres* that we find *endemism* most normal; the *Accipitres*, *Anseres*, and, more than all, the *Grallæ* are ever disposed to be *sporadic*, and indeed some species belonging to the latter order may be denominated truly cosmopolitan.

Taking then the birds of the order *Passeres* (which I consider ought properly to include the *Scansores* or *Zygodactyli*) as the chief materials from which to derive our deductions, let us suppose a species of this group, but of doubtful form and obscure plumage, to be placed before the Ornithologist, from whom its name is required. The first thing he looks to is, whether it is from the Old World or the New; and this is a point which, as a general rule, a mere glance at the external appearance of the object is sufficient to settle. The most obvious geographical division of the birds of this order certainly corresponds with the usually adopted primary division of the earth's surface. In fact, taking Ornithology as our guide, we may at once pronounce that the Faunæ of the Old and New worlds may, to all appearance, have been the subjects of different acts of creation. There are very many natural families which are quite peculiar to one or the other of these great divisions of the earth's surface, more subfamilies, few genera really common to the two, and very few, if any, species*.

The appended Table will show some of the most noticeable of the natural families of birds which are confined to the Old and New worlds respectively.

Familiæ Neogeanæ, sive Novi Orbis.		Familiæ Palæogeanæ, sive Orbis Veteris.	
Todidæ.	Tyrannidæ.	Coraciidæ.	Promeropidæ.
Momotidæ.	Cotingidæ.	Eurylamidæ.	Muscicapidæ.
Buceonidæ.	Rhamphastidæ.	Meropidæ.	Musophagidæ.
Galbulidæ.	Opisthocomidæ.	Upupidæ.	Coliidæ.
Trochilidæ.	Cracidæ.	Bucerotidæ.	Megapodidæ.
Icteridæ.	Tinamidæ.	Sturnidæ.	Pteroclidæ.
Cærebidæ.	Meleagrînæ.	Paradiseidæ.	Phasianidæ.
Formicariidæ.	Odontophorinæ.	Meliphagidæ.	Perdiciinæ.
Dendrocolaptidæ.			

With regard to the genera of *Passeres*, common to the two worlds, when we have excepted the truly cosmopolitan forms *Turdus*, *Hirundo*, *Picus*, &c., the number will be found very small; and it will be observed that these are invariably genera

* There are now acknowledged only 8 species of the order *Passeres*, in

belonging to temperate regions, and such as extend themselves only through the northern portion of the New World, failing entirely before we reach Tropical and Southern America, the most really characteristic region of Neogean Ornithology.

Such is the case in the genera *Sitta*, *Certhia*, *Regulus*, *Parus*, *Lanius*, *Perisoreus*, *Pica*, *Corvus* and *Loxia*. No member of these genera (which are common to the temperate portions of both hemispheres) extends farther south in the New World than the Table-land of Mexico. They are all quite foreign to Neotropical (Tropical American) Ornithology, although in the Old World most of them reach the tropics.

Having, therefore, made our first territorial division that of the two worlds, agreeing so far with geographers, we will look at the great continent and Australia *en masse*, and see what are its most natural subdivisions.

Here we find ourselves at once at issue with ordinary geographers. Europe may be a very good continent of itself, in many ways, and in some respects worth all the rest of the world put together,—“*Better fifty years of Europe than a cycle of Cathay*,” says the Poet,—but it is certainly *not* entitled to rank as one of the primary zoological regions of the earth’s surface, any more than as one of the physical divisions. Europe and Northern Asia are in fact quite inseparable. So far as we are acquainted with the ornithology of Japan—the eastern extremity of the temperate portion of the great continent, we there find no striking differences from the European *Avi-fauna*, but rather repetitions of our best-known European birds in slightly altered plumage,—representatives in fact of the European types. Temminck, indeed, has stated, that there are no less than 114 birds found in Japan, identical with European species. Some of these, however, have been since ascertained to be apparently distinct, but there can be no question as to the general strong resemblance of the Japanese *Avi-fauna* to that of Europe. How far south we are to extend the boundaries of this great temperate region of the Old World can

which no differences have, as yet, been detected in the comparison of specimens from the Old and New worlds, viz.:—

<i>Cotyle riparia</i> .	<i>Linota linaria</i> .
<i>Ampelis garrula</i> .	<i>Plectrophanes nivalis</i> .
<i>Junco hyemalis</i> .	<i>Plectrophanes lapponica</i> .
<i>Linota borealis</i> .	<i>Loxia leucoptera</i> .

The whole of these (with exception of *Cotyle riparia*) range to the extreme north, where the two worlds almost unite.

hardly be fairly ascertained, until the ornithology of Central Asia is much better worked out than is at present the case. While among the birds of the Himalayas we find many striking instances of the recurrence of European types, there is no doubt that the ornithology of the Indian Peninsula and the rest of Southern Asia, below the 30th parallel, is quite different from it.

Africa, north of the Atlas, along the southern shores of the Mediterranean, again appears to belong to Europe zoologically, and not to the continent to which it is physically joined. Such species of birds, foreign to Europe, as are found in Algeria and Morocco, are not usually connected with true African forms, but are again slightly modified representatives of Europæo-Asiatic species.

Such are the N. African species.	Representatives of the European.
<i>Garrulus cervicalis.</i>	<i>Garrulus cristatus.</i>
<i>Pica mauritanica.</i>	<i>Pica caudata.</i>
<i>Fringilla spodiogenia.</i>	<i>Fringilla cælebs.</i>
<i>Parus ultramarinus.</i>	<i>Parus cæruleus.</i>
<i>Picus numidicus.</i>	<i>Picus major.</i>

On the whole, therefore, I think we may consider Africa, north of the Atlas, Europe and Northern Asia, to form one primary zoological division of the earth's surface, for which the name Palearctic or Northern Palæogean Region would be best applicable.

The great continent of Africa will form a second well-marked division, after cutting off the slice north of the Atlas, but including Madagascar (where the African type appears to have reached the height of its peculiar development) and Western Arabia, to the Persian Gulf; for in this latter region, so far as our information goes, the African type seems to predominate over the Indian. Although there are genera of *Passeres* common to Africa and India, and even a few species, yet there can be no question as to the generally dissimilar character of the *Avi-faunæ* of these two countries. This second African division may be called the Æthiopian or Western Palæotropical Region.

Another tropical region of the Old World seems to be constituted by Southern Asia and the islands of the Indian Archipelago. The Philippines, Borneo, Java, and Sumatra, certainly belong to this division, but it is of course not yet possible to decide where the line runs which divides the *Indian* zoology from the Australian. New Guinea presents probably only a more exaggerated produc-

tion of the Australian type, and I should be inclined for the present not to separate New Zealand and the Pacific Islands generally from the Australian division. We should have, therefore, in the Old World one temperate region and three tropical; the eastern palæotropical or Australian advancing rather farther to the south than the others, the Indian or middle palæotropical being the most northern of the three.

In the New World we can simply divide the continent into northern and southern divisions; the northern, or Nearctic region, extending down the centre of the table-land of Mexico, and showing some indication of parallelism to the Palæarctic by the presence of certain temperate types; the Neotropical or southern (which embraces the whole of the rest of this great continent) being wholly free from any admixture of the sort, and in fact exhibiting, in my opinion (with the exception possibly of New Guinea), by far the richest and most peculiar *Avi-fauna* of the world's surface.

Having thus pointed out what I consider to be the primary divisions of the earth,—taking ornithology as our guide, I propose to devote a few lines to each region separately, noticing its apparent limits, its peculiarities, and most characteristic forms, and attempting to give an approximate estimate of the comparative abundance of ornithic species within its area.

The subjoined plan will serve to give at one view an illustration of my ideas as to the arrangement of these primary *Avi-faunæ* of the earth's surface. It must, however, be recollected that the calculations made as to the number of species to a square mile, can be only looked upon as mere attempts at approximations. Even in the whole general calculation, the presence of two variable elements—in the first place the number of square miles (about which geographers still give the most conflicting statements), and in the second place, the number of species of birds, concerning which ornithologists are as yet by no means agreed, greatly increases the uncertainty of the ratio deducible from them; and in working out the ratios in the respective regions, it is of course still more difficult to attain to any great degree of accuracy.

Taking however the whole number of square miles of dry land at 45,000,000, and the number of species of birds at 7500, which are both of them moderate estimates, we have on the average a single species to each 6000 square miles. In the different regions we shall attempt to show how far this ratio is departed from.

The zoological kingdoms or primary divisions are of course naturally separable into secondary divisions or provinces, but it would

be extending the limits of this communication too far to attempt to go into these at the present time.

I. PALEARCTIC REGION (*Regio Palæarctica*).

Extent.—Africa north of the Atlas, Europe, Asia Minor, Persia and Asia generally north of the Himalaya range, upper part of the Himalaya range?, northern China, Japan and the Aleutian Islands. Approximate area of 14,000,000 square miles.

Characteristic forms.—*Sylvia*, *Luscinia*, *Erythacus*, *Accentor*, *Regulus*, *Podoces*, *Fregilus*, *Garrulus*, *Emberiza*, *Coccothraustes*, *Tetrao*.

It cannot be denied that the ornithology of the Palæarctic or great temperate region of the Old World is more easily characterized by what it has not than by what it has. There are certainly few among the groups of birds occurring in this Region, which do not develop themselves to a greater extent elsewhere. For we must acknowledge that the most productive seats of animal life, where all the bizarre and extraordinary forms that the Naturalist best loves are met with, lie under the suns of the tropics, and far removed from temperate latitudes. The most prevalent forms among the *Passeres*, of the Palæarctic Region, are perhaps the plain dull-coloured *Sylviinæ*, distinguished rather for their melodious song than by any external beauty of plumage or singularity of form. Upwards of 35 species of this subfamily occur in the ornithology of Europe alone; and when Northern Africa and the whole North of Asia are taken into calculation, the number would be considerably increased, and this Region may be considered the true focus of the group.

The genus *Erythacus* would be perhaps as good a representative genus as any as a type of Palæarctic ornithology; a second species (*Erythacus akahige*) occurring at the eastern extremity of the Asiatic continent, and there beautifully representing our common Robin. True *Emberiza* is likewise very characteristic of the temperate portion of the Old World, nearly the whole of the known species being found in Europe or Northern Asia. *Accentor* is perhaps more strictly a northern Himalayan form, with several representatives within the Palæarctic Region; but *Fregilus*, *Podoces*, *Garrulus*, *Tetrao*, and numerous species of *Anatidæ* are likewise eminently noticeable as among the most typical forms of Palæarctic ornithology.

The most recent summary of the Birds of Europe gives—

1. Accipitres.....	57	} 581 species.
2. Passeres	238	
3. Scansores.....	12	
4. Columbæ	7	
5. Gallinæ.....	22	
6. Struthionæ	0	
7. Grallæ	101	
8. Anseres.....	144	

It is very difficult to say what additions should be made to this in order to give the approximate number of the birds of the whole Palæarctic Region; but a moderate calculation does not show more than 650 species truly belonging to this fauna: for it must be recollected that the number 581 contains many birds of rare occurrence in Europe, and which must be correctly reckoned as belonging to other divisions. As we have in the Palæarctic Region the enormous land area of probably upwards of 14,000,000 square miles, this will give us a species for each 21,000 square miles, speaking in round numbers; and it consequently follows (as might have been expected), that the Palæarctic is by far the least prolific region of ornithic life on the globe. According to my ideas, therefore, the statement in Johnston's 'Physical Atlas,' that "*Europe possesses more species than any other zoological province*," is exactly contrary to the fact.

II. ÆTHIOPIAN OR WESTERN PALÆOTROPICAL REGION (*Regio Æthiopica*).

Extent.—Africa, south of the Atlas range, Madagascar, Bourbon, Mauritius, Socotra and probably Arabia up to the Persian Gulf, south of 30° N. l.; an approximate area of 12,000,000 square miles.

Characteristic forms.—*Gypogeranus*, *Helotarsus*, *Polyboroides*, *Gypohierax*, *Melierax*, *Macrodipteryx*, *Irrisor*, *Fregilupus*, *Bucorvus*, *Apaloderma*, *Parisoma*, *Macronyx*, *Lioptilus*, *Sericolius*, *Malaenotus*, *Laniarius*, *Chaunonotus*, *Prionops*, *Sigmodus*, *Phyllastrephus*, *Lanioturdus*, *Vidua*, *Juida*, *Buphaga*, *Terreauxia*, *Lamodon*, *Indicator*, *Musophaga*, *Colius*, *Pæocephalus*, *Numida*, *Phasidus*, *Struthio*, *Baleniceps*, *Scopus*.

(Madagascar). *Euryceros*, *Falculia*, *Oriolia*, *Philipitta*, *Brachypteracias*, *Atelornis*, *Bernieria*, *Hartlaubius*, *Artamia*, *Vanga*, *Coua*, *Leptosomus*, *Vigorsia*, *Mesites*, *Biensis*.

The characteristic forms of African Ornithology are very nume-

rous. Several groups of birds, which seem clearly entitled to rank as distinct families, or at least as subfamilies, are wholly peculiar to this region, such as the *Coliidae*, *Musophagidae*, and *Buphaginæ*. There are also very many genera, of which the species are all confined to this continent; the principal of which I have enumerated in my List of Typical forms. The island of Madagascar, however, is the locality where the African type seems pushed to its utmost degree of development. There are many genera quite peculiar to this island, or which have a single representative or so upon the adjacent coast of the continent. Such are *Oriolia*, *Atelornis*, *Brachypteracias*, *Tanga*, and others which I have mentioned above, not to mention the extinct gigantic *Aepyornis*. Bourbon, Mauritius and the other Mascarene islands all belong to Africa zoologically, and have only recently lost the now extinct birds of the genera *Didus*, *Pezophaps* and their allies, which were, so far as we know, types quite peculiar to this locality.

Dr. G. Hartlaub's lately published *System der Ornithologie West-Africa's* gives as inhabitants of that part of the continent,—

Accipitres	56	} 753.
Passeres	450	
Scansores	69	
Columbæ	17	
Gallinæ	19	
Struthiones	1	
Grallæ	99	
Anseres	42	

In the preface to Dr. Hartlaub's work will be found a *resumé* of all the most important facts known concerning African Ornithology.

For North-eastern Africa we have a List lately published by Dr. Heuglin, who mentions—

1. Accipitres	95	} 754 species.
2. Passeres	372	
3. Scansores	38	
4. Columbæ	14	
5. Gallinæ	24	
6. Struthiones	1	
7. Grallæ	130	
8. Anseres	80	

A correct catalogue of the Birds of S. Africa would probably be not less numerous in species.

On the whole, therefore, I think we cannot allow for the Western Palæotropic region less than 1250 species, which, with an area of 12,000,000 square miles, gives one species to each 9600 square miles nearly.

III. INDIAN OR MIDDLE PALÆOTROPICAL REGION (*Regio Indica*).

Extent.—India and Asia generally south of Himalayas, Ceylon, Burmah, Malacca and Southern China, Philippines, Borneo, Java, Sumatra and adjacent islands; an area of perhaps 4,000,000 square miles.

Characteristic forms.—*Harpactes*, *Colocalia*, *Calypomena*, *Eurylæmus*, *Buceros*, *Garrulax*, *Liothrix*, *Malacocercus*, *Pitta*, *Timalia*, *Pycnonotus*, *Phyllornis*, *Pericrocotus*, *Analcipus*, *Acridotheres*, *Gracula*, *Sasia*, *Megalæma*, *Phœnicophaps*, *Dasylophus*, *Palæornis*, *Pavo*, *Cerionis*, *Polyplectron*, *Argus*, *Euplocamus*, *Rollulus*, *Casuarius*.

Mr. Swainson, in his article in H. Murray's 'Encyclopedia of Geography,' considers the mainland of Southern Asia and the larger Indian islands as belonging to two different zoological regions. But it is now generally acknowledged that this is not the case. There are so many generic forms which commence in Southern Asia and extend over the greater part of the Indian Archipelago, that it is not possible to look upon these countries as belonging to different regions, though they doubtless form distinct subkingdoms or provinces, in each of which will be found corresponding representative species. How far in an eastern direction we are to extend the boundaries of the Middle Palæotropical Region is a difficult question, which can hardly be answered until we know more of the Natural History of these great islands; but there is no doubt that Borneo, Sumatra and Java belong to this zoology, but probably not Celebes.

The most characteristic forms of the Indian region are without doubt the *Phasianidæ*, the whole of which magnificent group of birds may be said to be confined to this region,—one or two species only straying into the confines of Palæarctic zoology, and a single genus, *Meleagris*, representing them in America, and the few birds of the genera *Numida*, *Agelastus* and *Phasidus* in Africa.

If the number of species duly attributable to the Middle Palæo-

tropical Region, be reckoned at about 1500, and its geographical area at nearly 4,000,000 square miles, we have a species to each 2600 miles nearly, which indicates a degree of intensity of species only surpassed by Tropical America.

IV. AUSTRALIAN OR WESTERN PALÆOTROPICAL REGION (*Regio Australiana*).

Extent.—Papua and adjacent islands, Australia, Tasmania and Pacific Islands ; an area of perhaps 3,000,000 square miles.

Characteristic forms.—

1. (Australia.) *Ægotheles*, *Falcunculus*, *Colluricincla*, *Grallina*, *Gymnorhina*, *Strepera*, *Cinclosoma*, *Menura*, *Psophodes*, *Malurus*, *Sericornis*, *Epthianura*, *Pardalotus*, *Chlamydera*, *Ptilonorhynchus*, *Struthidea*, *Licmetis*, *Calyptorhynchus*, *Platycercus*, *Euphema*, *Calopsitta*, *Climacteris*, *Scythrops*, *Myzantha*, *Talegalla*, *Leipoa*, *Pedionomus*, *Dromaius*, *Cladorhynchus*, *Tribonyx*, *Cereopsis*, *Anseranas*, *Biziura*.

2. (Papua.) *Sericulus*, *Melanopyrrhus*, *Ptiladela*, *Edoliosoma*, *Peltops*, *Rectes*, *Manucodia*, *Gymnocorvus*, *Astrapia*, *Paradisea*, *Epimachus*, *Nasiterna*, *Charmosyna*, *Cyclopsitta*, *Goura*, &c.

3. (New Zealand.) *Neomorpha*, *Prosthemadera*, *Anthornis*, *Acanthisitta*, *Mohoa*, *Certhiparus*, *Turnagra*, *Aplonis*, *Creadion*, *Nestor*, *Strigops*, *Apteryx*, *Ocydromus*.

4. (Pacific Islands.) *Moho*, *Hemignathus*, *Drepanis*, *Pomarea*, *Metabolus*, *Sturnoides*, *Leptornis*, *Tutare*, *Loxops*, *Coriophilus*, *Ptilonopus*.

New Guinea is in some respects so peculiar in its Ornithology, as far as we are acquainted with it, that it would at first sight appear as if it ought to form a zoological region of itself. But there are certainly many genera common to it and Australia (for example, *Podargus*, *Tanysiptera*, *Alcyon*, *Mimeta*, *Ptilorhis*, *Cracticus*, *Manucodia*, &c.) ; and for the present I am inclined to retain it as part of the Australian region. Both New Zealand and the Pacific islands have also some claims to stand alone as separate regions, their forms of ornithic life being in many cases extremely peculiar and local. If they can be attached anywhere, however, it is to Australia ; and I have included them temporarily in the same region. Mr. Gould's 'Birds of Australia' has made us

well acquainted with the ornithology of that continent; but there still remains New Guinea and the multitudinous adjacent islands, which doubtless contain numbers of species as yet unknown to science. Mr. Gould, in his 'Birds of Australia,' enumerates—

1. Accipitres.....	36	} 600.
2. Passeres	311	
3. Scansores.....	36	
4. Columbæ	23	
5. Gallinæ.....	16	
6. Struthiones ...	1	
7. Grallæ	78	
8. Anseres	99	

in all 600 species.

The most characteristic forms of this region are perhaps the *Paradiseidæ* and *Epimachidæ* (both peculiar to it); the *Meliphagidæ*, one or two genera only of which are found externally, and of which between 60 and 70 species occur in Australia alone; the genera *Calyptrorhynchus*, *Microglossa*, *Trichoglossus*, *Platycercus*, *Nestor*, *Strigops*, and many other forms amongst the *Psittacidæ*, besides a vast number of others.

Taking 3,000,000 of square miles as the amount of dry land in this region, and allowing 1000 species as peculiar to it, we have one species to every 3000 square miles, showing us that this is little inferior to the middle Palæotropical Region in intensity of species.

V. NEARCTIC OR NORTH-AMERICAN REGION (*Regio Nearctica*).

Extent.—Greenland and North America down to centre of Mexico—area of perhaps 6,500,000 square miles.

Characteristic forms.—*Trochilus*, *Sialia*, *Toxostoma*, *Icteria*, *Vireo*, *Mniotiltinæ*, *Chamaea*, *Certhia*, *Sitta*, *Neocorys*, *Calamospiza*, *Zonotrichia*, *Picicorvus*, *Gymnocitta*, *Meleagris*.

As is the case in the Old World, most of the genera belonging to the northern part of the New World are better represented in its tropical than in its temperate portions. Northern America, however, produces *Sylvicolæ* and *Zonotrichiæ* in much greater abundance than southern America, and these genera (which are analogous to the *Sylviinæ* and *Emberizæ* of the Old World) are perhaps its most ordinary characteristic forms. I have already

mentioned the chief genera common to the northern portions of both hemispheres. These are also characteristic of *Neartic* in contrast to Neotropical zoology, as none of them extend into Southern America. The ornithology of the U. S. of America (which now embrace a very large proportion of the *Neartic* region) contains upwards of 620 species.

Calculating the area of the *Neartic* Region at six millions and a half of square miles, and the species peculiar to it at 660, we have about 9000 miles for each species, making this region, as might have been supposed, the least productive of ornithic life, after the *Palearctic*.

VI. NEOTROPICAL OR SOUTH-AMERICAN REGION (*Regio Neotropica*).

Extent.—West India Islands, Southern Mexico, Central America and whole of S. America, Galapagos Islands, Falkland Islands. Estimated area of about 5,500,000 square miles.

Characteristic forms.—1. (Continental.) *Sarcorhamphus*, *Ibycter*, *Milvago*, *Thrasaëtus*, *Cymindis*, *Herpetotheres*, *Steatornis*, *Nyctibius*, *Hydropsalis*, *Eleothreptus*, *Trogon*, *Bucco*, *Monasa*, *Galbula*, *Furnarius*, *Synallaxis*, *Anabates*, *Oxyrhamphus*, *Dendrocolaptes*, *Pteroptochos*, *Rhamphocænus*, *Campylorhynchus*, *Hylophilus*, *Lessonia*, *Agriornis*, *Formicarius*, *Formicivora*, *Grallaria*, *Tenioptera*, *Tityra*, *Conopophaga*, *Pipra*, *Rupicola*, *Phænicereus*, *Cotinga*, *Gymnoderus*, *Cephalopterus*, *Vireolanus*, *Cyclorhis*, *Thamnophilus*, *Tanagra*, *Calliste*, *Saltator*, *Euphonia*, *Catamblyrhynchus*, *Phytotoma*, *Opisthocomus*, *Ramphastos*, *Picumnus*, *Celeus*, *Crotophaga*, *Cultrides*, *Penelope*, *Oreophasis*, *Crax*, *Thinocorus*, *Tinamus*, *Psophia*, *Cariama*, *Eurypyga*, *Parra*, *Palamedea*, *Chauna*, *Aramus*, *Merganetta*, *Heliornis*.

2. (Antilles.) *Todus*, *Priotelus*, *Cinclocerthia*, *Dulus*, *Loxigilla*, *Phænicophilus*, *Spindalis*, *Glossipectus*, *Teretristis*, *Saurothera*.

3. (Galapagos.) *Certhidea*, *Cactornis*, *Camarhynchus*, *Geospiza*.

There can be no question, I think, that South America is the most peculiar of all the primary regions in the globe as to its ornithology. There are at least eight or nine distinct families of birds which are quite confined to this country, many of these embracing a multitude of different genera and species. The *Trochilidæ* (which are the distinguishing family of the new world *paraphase*) are now known to be more than 320 in number, and

nearly the whole of them belong to tropical America, a few species only ranging into the northern portions of that continent. It is of course quite impossible to ascertain exactly the boundary between the northern and southern zoological regions of the New World; but many of the peculiar forms of the southern division appear to extend some way up the coast-line of Southern Mexico, even north of the isthmus of Tehuantepec; whilst northern forms range down the table-land quite into the Southern States of the Mexican Union. Thus we find one or two representatives of all the most characteristic South American groups occurring to the north of Panama,—*Galbula melanogenia* representing the *Galbulidæ*; *Pipra mentalis* and *Manacus Candæi*, the *Piprinæ*; *Calliste larvata*, the genus *Calliste*; *Cotinga amabilis*, the *Cotingæ*, and so on.

The Antilles seem to be a kind of debateable ground between the two regions, but are more properly referable, I suppose, or at least the greater portion of them, to the southern region. They furnish us, however, with several peculiar genera which do not occur elsewhere.

The Neotropical Region is without doubt, I think, rich in number of species beyond any other. A calculation which I made some short time ago of species occurring southwards of Panama gave me—

1. Accipitres	95	} 2000 species ;
2. Passeres	1360	
3. Scausores	230	
4. Columbæ	25	
5. Gallinæ	80	
6. Struthiones	2	
7. Grallæ	128	
8. Anseres	80	

and I am decidedly of opinion that, what with taking recent additions into consideration and adding on Central America, we cannot estimate the number of birds belonging to this region at less than 2250. Taking the approximate area at $5\frac{1}{2}$ millions of square miles, this will give a species to each 2400 square miles. It follows, therefore, that this region is more richly endowed with ornithic species than any other portion of the globe.

SCHEMA AVIUM DISTRIBUTIONIS GEOGRAPHICÆ.

CREATIO NEOGEANA

Sive Orbis novi. } = $\frac{1}{4,000}$.
2,000,000 square miles, }
3,000 species, }

ORBIS TERRARUM.

45,000,000 square miles, } = $\frac{1}{6,000}$.
7,500 species, }

CREATIO PALÆOGEANA

Sive Orbis antiqui. } = $\frac{1}{7,300}$.
33,000,000 square miles, }
4,500 species, }

V.

Regio Nearctica

Sive Boreali-Americana.
6,500,000 square miles,
660 species,
1
= $\frac{1}{9,000}$.

VI.

Regio Neotropica

Sive Meridionali-Americana.
5,500,000 square miles,
2,250 species,
1
= $\frac{1}{2,400}$.

II.

Regio Æthiopica

Sive Palæotropica Hesperica.
12,000,000 square miles,
1,250 species,
1
= $\frac{1}{9,600}$.

III.

Regio Indica

Sive Palæotropica Media.
4,000,000 square miles,
1,500 species,
1
= $\frac{1}{2,600}$.

IV.

Regio Australiana

Sive Palæotropica Eoa.
3,000,000 square miles,
1,000 species,
1
= $\frac{1}{3,000}$.

Regio I. 620 species.

" II. 1,200 "

" III. 1,760 "

" IV. 1,000 "

" V. 570 "

" VI. 2,350 "

Total 7,500 "

Note on the Occurrence of *Phyllosoma commune* on the Coast of Cornwall. By JONATHAN COUCH, F.L.S. &c.

[Read November 5, 1857.]

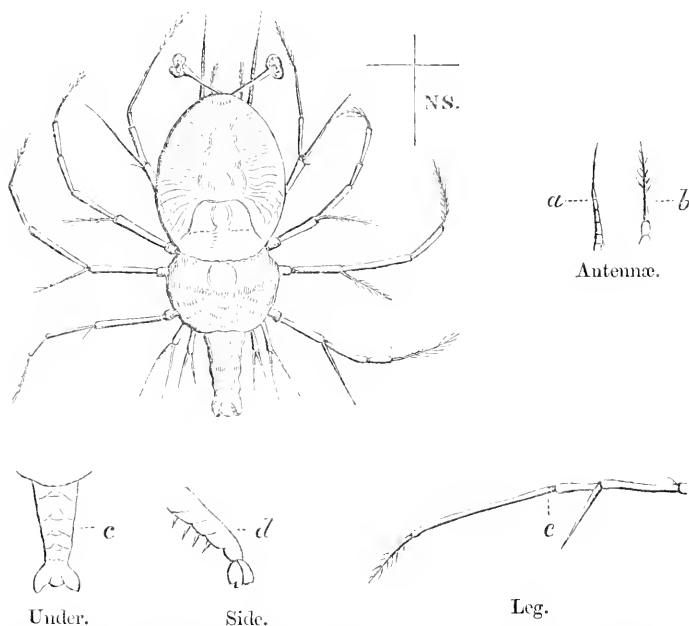
I HAVE the pleasure of communicating to the Linnean Society a notice of the occurrence of the *Phyllosoma commune* on the coast of Cornwall; and although, from an announcement in the Report of the Royal Cornwall Polytechnic Society for the year 1851, it appears that it has been taken once before in our waters, yet as no further remark is made concerning it by W. Cocks, Esq., who had noticed it, and no description or figure is to be found in our President's 'History of British Stalkeyed Crustacea,' it is hoped that a representation of this creature, drawn from a British specimen, with such observations as I was able to make from an example newly taken, will be acceptable to the Society.

The specimen was captured near Polperro, in a pilchard drift-net, four leagues from land, at a depth of about three fathoms from the surface, on the 1st August, 1857. It attracted the particular notice of the fisherman from the sparkling brilliancy of its eyes, while the rest of its body was almost as transparent as glass. When brought on shore a few hours afterwards, it was able to exert some moderate degree of activity. It came into my possession about twenty-four hours after its death, and its immersion in a bottle of glycerine, the best fluid I am acquainted with for ensuring the preservation of many small subjects of natural history, which it effects without changing anything of their colour, and but little of their transparency.

This example is a little less than an inch in length, and of the form and proportions represented in the figure which accompanies this paper; but the sketch I have made is enlarged, that I might more readily represent the disposition of the parts. The body is very thin, or depressed; the border of the carapace egg-shaped, being broadest a little behind the middle of the length. The head is represented as distinct from the carapace (thorax, M. E.); but the separation is scarcely discernible. The eyes on long and slender footstalks, which are inserted together at one point, are erected divergingly: the upper part of the eyestalk is enlarged, and the eye itself formed of two unequal portions, the anterior of which is the larger. The principal [external] antennæ wide apart, projecting beyond the eyes, with 3 joints, the lowest furnished with a fine spine. The internal antennæ [antennules] appearing between the footstalks of the eyes and the external antennæ, and

shorter than both; divided near the tip, and the (slightly) longer branch having a scarcely perceptible brush. Both pairs of antennæ are directed straight forward; but when alive, it is probable that, together with the eyes, they possess extensive motion.

The second or posterior carapace, called by Dr. Milne Edwards the thorax, is less than the former, but equally thin and transparent, and near its border carries the coxæ, or insertion of the proper legs. Posteriorly it has attached to it the abdomen, terminating in two long, bifid processes. I count 4 rings on the abdominal portion, and there are probably 5; under these are 4 oval plates, perhaps in pairs. Lateral plates of the tail, oval; the central less distinct and not quite so long: legs long, slender, four pair, bifurcate at the second joint; the posterior bifurcation scarcely longer than the second phalanx; the first and last pair having this part rather longer than the two intermediate ones. All of them (the principal branches and bifurcations) simple, pointed, clothed with hairs toward the end.



Phyllosoma commune, taken near Polperro, August 1, 1857, in a pilchard drift-net, four leagues from land and three fathoms from the surface.

The eyes are the only parts that can be said to possess colour,

the globe of the eye and a small part of the stalk supporting it being of a rich brown ; but those who saw the animal alive informed me, that on the sides of the carapace were patches of the colour of silver, which, however, had vanished when it came to my hands.

At first nothing could be discerned of its interior organization, beyond some slight lines, which appeared to be nerves or blood-vessels, and which proceeded from the upper border of the thorax to the antennæ or eyes. But as the glycerine penetrated into its substance, the structure became visible without being obscure. Proceeding from the narrow longitudinal line, the whole breadth of the carapace presented an organization which I could not doubt was branchial. The organ on either side appeared to arise with 11 roots : the shortest, which were in front, were simple ; but the greater number were bifurcate, and some had no less than four divisions, 22 in all. The four pairs of legs are inserted into the border of the thorax, and at the place of insertion the margin appears to possess a little angularity, and lines of greater density are seen passing off from the coxæ towards a place of meeting in the middle. Those I suppose to be muscles.

[MEMORANDUM.]

The species of *Phyllosoma* represented in the figure accompanying Mr. Couch's paper, appears to differ in one respect from the form described by M. Edwards under that name, in which the cephalic tergal plate is stated to be *less* than the thoracic. The diversity, however, may be due to difference of age or sex ; and it is to be remarked, that Mr. Couch's figure corresponds very closely in this and other respects with that of *Phyllosoma commune* (Leach) given in Tuckey's 'Voyage to the River Zaire,' p. 417, Pl. 18. fig. 6.

The very recent researches of Dr. Gegenbaur (Siebold and Köl liker's Zeitsch. f. Wiss. Zoolog. Band v. p. 352 ; and Müller's Archiv, 1858, p. 43) have thrown much light upon the internal organization of *Phyllosoma*. From these it would appear to be placed beyond doubt, that the organs supposed by Mr. Couch to be internal *branchiæ*, are in reality, as suggested by M. M. Edwards (Hist. Nat. des Crustacées, t. ii. p. 475), the liver, and that the respiratory function is performed chiefly by the expanded external surface of the body, although special organs analogous to *branchiæ* exist in the form of feathered appendages to the feet.

For the detailed information concerning the nervous, circulatory and alimentary systems in *Phyllosoma*, reference should be made

to the latter of the two papers cited above. And it need here only, be remarked that in the condition of the circulatory system, this remarkable genus would appear to differ widely from the Stomapod type and very closely to resemble the Decapoda.—[G. B.]

On the Zoology of New Guinea.

By PHILIP LUTLEY SCLATER, M.A., F.L.S. &c.

[Received December 3, 1857. Read December 17, 1857.]

IN pointing out what appear to me to be the principal zoological divisions of the earth's surface (as I attempted to do in the course of the observations on the general geographical distribution of birds which I made before the Linnean Society last summer), it was not without some hesitation that I placed New Guinea in the same region as Australia. Since that time I have paid some attention to what is known of the zoology of this interesting country, and have had an opportunity of revisiting the museums of Paris and Leyden, where the best series of its animals are to be found. From what I have thus observed, and from the writings of the Dutch naturalists on the subject, I am now quite persuaded that, while Borneo, Java and Sumatra are inseparably allied to the South-Asiatic fauna, Amboyna, Timor, Gilolo, New Guinea and probably Celebes, with some of the other Eastern islands, are properly appertinent to the same primary zoological region as Australia. The straits of Macassar are perhaps the determining line separating these two regions, the island of Lombok (which lies due south of them) being (as Mr. Wallace's investigations have shown) in some respects debateable ground between them.

With the view of supplying materials towards a more perfect understanding of the distribution of organized life in these countries, I have drawn up the following summary of the mammalia and birds of New Guinea, as far as the scattered and scanty notices on this subject met with among the writings of different travellers and naturalists have enabled me to do so.

The first explorer of New Guinea who has left us any record of his scientific proceedings is Sonnerat, who during his celebrated voyage in the year 1771 collected a considerable number of plants and birds, principally on the island of Jobie in the Bay of Geelvink, of which he afterwards gave an account in his '*Voyage à la Nouvelle Guinée*,' published in Paris in 1776. Some of the species

figured by Sonnerat were provided with scientific names by Scopoli in the second part of his '*Deliciæ Faunæ et Floræ Insubricæ*' (fol. Ticini, 1786); and these authors are therefore our earliest authorities on Papuan ornithology.

In 1818 MM. Quoy and Gaimard, in the French discovery-ship '*Uranie*,' visited Guebé, Waigion and Rawak, and in the "*Zoology*" of their voyage described three or four species of birds from these islands, but do not appear to have brought anything from the main coast of New Guinea.

The next era in the scientific exploration of this country is one of considerable importance. From the 26th of July to the 9th of August, 1824, the French discovery-ship '*Coquille*,' remained at anchor in a harbour in the north-eastern part of the Bay of Geelvink, named by the French "*Havre-Dorey*." The well-known naturalist Lesson was attached to this expedition, as also M. Garnot. During their twelve days' stay they procured, amongst other objects of natural history, about fifty species of birds, the greater part of which were quite new to science and were afterwards described by them in their joint work upon the zoology of the expedition. M. Lesson's other works, his '*Traité*' and '*Manuel d'Ornithologie*,' and '*Histoire des Paradisiens*,' &c., likewise contain many interesting notices arising from observations made during his sojourn on this spot.

Three years afterwards, in 1827, a second French discovery-ship, the *Astrolabe*, under the command of Dumont d'Urville, passed another twelve days in the same place. MM. Quoy and Gaimard, who were again the naturalists of this expedition, obtained, on this occasion, twelve additional novelties in ornithology, which they afterwards described and figured in the '*Zoology of the Voyage of the Astrolabe*.'

The next event to be recorded in the scientific history of Papua sprang from the energy of a different people. A few months after this, in the beginning of 1828, the Government of Holland sent the corvette '*Triton*' and schooner '*Iris*' from Batavia to found a settlement on the west coast of New Guinea. The expedition had on board a royal commissioner and several members of the scientific commission which was then engaged in the exploration of the Dutch possessions in the East Indies. They first explored the Dourga Strait on the southern coast, and thence returning northwards, discovered in the district called Lobo, what they described as a deep and spacious bay shut in by elevated land, and of a picturesque aspect. There they commenced their establish-

ment with the construction of a fort, and took formal possession on the 24th of August, 1828, of the whole coast in the name of the King of the Netherlands, with the usual solemnities. The bay was christened "Triton's Bay," and the strait leading to it, "Iris Strait," to commemorate the names of the two vessels. After several years' occupation, this settlement was eventually abandoned on account of the excessive unhealthiness of the locality; but MM. Müller and Macklot, the two scientific commissioners, were by no means idle during their stay there on the first foundation of the settlement, and it is to their industry that the Leyden Museum is indebted for the finest series of specimens of natural history from this wonderful country which is in existence. It is much to be regretted that no full account has ever been given to the public of these discoveries. In the magnificent work entitled, '*Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche overzeesche bezittingen*,' in which the results of the labours of the scientific commission are reported, it is stated that 119 species of birds were obtained in New Guinea; but no complete catalogue is given of them. In fact, in the zoology of this work only monographs of one or two of the more noticeable genera of birds are contained; others are shortly characterized in the foot-notes attached to the volume which treats of the Ethnography, and is entitled '*Land en Volkenkunde*,' whilst a large remainder have as yet only received MS. names in the Leyden Museum, under which many of them are inserted in Prince Bonaparte's '*Conspectus*,' often even without any attempt at descriptive characters.

The recently published volume on the zoology of the '*Voyage au Pôle Sud*' (the plates of which were issued several years since), contains several novelties in Papuan ornithology, which were met with during the passage of the exploring vessels *Astrolabe* and *Zélée* along the southern and western coasts of New Guinea; and some scattered notices on the same subject also occur in the reports of one or two of the English expeditions.

From all these sources we are acquainted with about 170 species of birds inhabiting New Guinea; a number which, when we consider the large extent of its surface and the very small portion of it which has been scientifically explored, consisting only of two small isolated spots at its western extremity and parts of its southern coasts, we may calculate to represent perhaps not more than one-third of the species it really possesses. Of these species about 109 appear to be peculiar to New Guinea, that is, they have not hitherto been found

elsewhere; 14 are common to New Guinea and Australia; 35 occur in other of the Eastern islands besides New Guinea, and the remainder are birds of wide distribution. The true tendency of this ornithology is perhaps better manifested by the presence of certain genera, such as *Ptilotis*, *Entomophila*, *Tropidorhynchus*, *Mimeta*, *Cracticus*, *Ptilonorhynchus*, and *Geopelia*, which are highly characteristic of the fauna of Australia; and by the occurrence in Northern Australia of members of the Papuan genera *Tanyptera*, *Manucodia*, *Ptilorhis* and *Microglossa*. On the other hand, the presence of species of *Buceros*, *Arachnothera*, *Eupetes* and *Corvus*, and of *Peltops* (a genus of *Eurylemidae*) in New Guinea, types which do not extend into Australia, serve to remind us that New Guinea is somewhat intermediate in the character of its fauna, as in its geographical position, between the Indian and Australian regions. Upwards of 20 generic forms appear, as far as we know, to be quite restricted to Papua and its adjacent islets, namely, *Melidora*, *Xanthomelus*, *Melanopyrrhus*, *Ptiladela*, *Edoliisoma*, *Peltops*, *Rectes*, *Gymnocorvus*, *Paradisea*, *Diphyllodes*, *Cicinnurus*, *Lophorina*, *Parotia*, *Seleucides*, *Epimachus*, *Paradigalla*, *Astrapia*, *Charmosyna*, *Nasiterna* and *Eutrygon*; but the propriety of the generic isolation of some of these types may be questioned by some naturalists. One very peculiar family, the *Paradiseidae*, is quite confined to New Guinea and its adjacent islets. I have been particular in ascertaining what species of these remarkable birds have been really met with *alive* in the localities visited by naturalists. M. Lesson, it appears, procured *P. rubra* on the island of Waigiou, and *P. Papuana* and *Cicinnurus regius* at Havre-Dorey; MM. Müller and Macklot found at Triton's Bay only the two latter species. M. Lesson likewise met with *P. apoda* in the Aru islands, and Mr. Wallace, who has recently visited these islands, also found *P. apoda* and *Cicinnurus regius* living there. It is much to be hoped that this latter gentleman, who has so successfully commenced his explorations in the Eastern archipelago may carry them to an equally prosperous termination and widely extend our present imperfect knowledge of the zoology of these countries.

Again, New Guinea agrees with Australia in the absence of two families, the Wood-peckers (*Picidae*) and Pheasants (*Phasianidae*), both of which are very fully developed in the region of Indian zoology. It is also observable that hitherto no *Fringillidae* appear to have been met with in New Guinea, although I have little doubt that, when the zoology is more fully explored, forms connected

with *Amadina*, *Poephila* and their allies, which are abundant on the northern coasts of New Holland, will be detected.

Thus far I have spoken only of the Birds of New Guinea, as of the Mammalia there is not much to say, except to call attention to the fact of its close intimacy with Australia in this respect. Out of the ten species of this class of beings hitherto observed in New Guinea, all, with the exception of the *Sus* and the Dugong of the coasts, belong to the *Marsupialia*, an order which is pre-eminently Australian. Of the genera to which these Marsupials are referred, two are peculiar to New Guinea, and one (*Cuscus*) belongs rather to the Moluccas; but the three others are characteristic Australian forms. The tables given in the zoological volume of the 'Verh. over de Nat. Gesch.' present us with a most instructive view of the general geographical distribution of the Mammalia in the great Eastern islands. In Sumatra, Borneo and Java we find the most highly organized *Quadrumanæ*, large Carnivores (*Felis* and *Ursus*), Pachyderms; in Sumatra even a peculiar species of Elephant*, Rhinoceroses and a multitude of the higher classes of Mammalia. What a contrast to this, when we cast our eye down the columns relating to Celebes, Amboyna, Timor and New Guinea! A single straggling *Cercopithecus* (in Celebes and Timor only) and two other *Quadrumanæ* (in Celebes), a single *Cervus*, an Antelope, a *Viverra* (sole representative of the Carnivora), with two or three *Suidæ*, constitute nearly the whole of the Placental Mammals found in these great islands, with the exception of Bats and Rodents. Here, as in Australia, the two latter Orders are found in company with the Marsupials, an additional piece of evidence to my mind of the correctness of Professor Owen's recent arrangement of these groups at the base of the Placental Mammalia: for the student of the geographical distribution of animals soon learns to appreciate the value of the old maxim "*noscitur a sociis*," quite as applicable in this sense to organized existences generally, as, taken in its usual meaning, to mankind.

The following is what I believe to be a tolerably perfect list of the Mammifers and Birds which have hitherto been positively recognized as having been met with in New Guinea and its adjacent islets. In every case I have added the precise locality in which each has been found, when that is ascertainable, and the authority for such locality. I have likewise generally noted the Museums in which examples of the species are contained, nearly all of

* *Elephas sumatranus*, Temminck, Coup d'œil sur les poss. Nederl. i. p. 328, et ii. p. 91; Bp. in P. Z. S. 1849, p. 144 (note).

which, thanks to the liberality of the Directors of these institutions, I have had the satisfaction of examining myself.

MAMMALIA.

1. *Sus papuensis*, Lesson.

Voy. Coq. Zool. i. p. 171, pl. 8. Havre-Dorey (*Less.*). Mus. Paris.

2. *Halichore australis*, Owen.

Jukes, Voy. Fly. ii. p. 323; Müll. Verh. Ethn. p. 21. Coasts of New Guinea (*Müll.*). Endeavour St., N. Australia (*Jukes*). Brit. Mus.

3. *Dorcopsis Brunii*, Schreber, sp.

Müll. Verh. Zool. Mamm. p. 131, p. 21. Mus. Ludg. et Brit.

4. *Dendrolagus ursinus*, Müll.

Verh. Zool. Mamm. p. 141, pl. 19. Mus. Brit. et Lugd.

5. *Dendrolagus inustus*, Müll.

Verh. Zool. Mamm. p. 143, pl. 20. Mus. Brit. et Lugd.

6. *Cuscus maculatus*, Desm., sp.

Voy. Coq. Zool. i. p. 156, pl. 5; Müll. Verh. Ethn. p. 20. Mus. Par. et Brit.

7. *Cuscus chrysorrhous*, Temm.

Phalangista chrysorrhous, Temm. Mon. Mamm. i. p. 12; Waterh. Mamm. i. p. 537. South-eastern coast of N. G. (*Jukes*). Mus. Lugd. et Brit.

8. *Belidea Ariel*, Gould?

P. Z. S. 1842, p. 11; Mamm. Austr. *Petaurus sciureus*, Müll. Verh. Ethn. p. 20.

The *Belidea* of New Guinea probably belongs to this North-Australian species, which is different from *B. sciurea* of N. S. Wales; see Waterh. Mamm. i. p. 337. Mus. Lugd. et Brit.

9. *Perameles doreyanus*, Q. & G.

Voy. Astr. Zool. i. p. 100, pl. 16. Havre-Dorey (Q. & G.). Mus. Paris.

10. *Phascogale melas*, Müll.

Verh. Ethn. p. 20. Lobo (*Müll.*). Mus. Lugd.

AVES.

FALCONIDÆ.

1. *Ichthyæetus leucogaster*, Gm., sp.

Gould, B. Austr. i. pl. 3. *Falco blagrus*, Müll. Verh. Ethn. p. 21. Lobo (*Müll.*). Mus. Lugd.

2. *Haliastur leucosternus*, Gould.

Gould, B. Austr. i. pl. 4. *Haliæetus girrenera*, Less. Voy. Coq. Zool. i. p. 615. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Par. et Lugd.

3. *Astur Norœ Hollandiæ*, Gm., sp.

Gould, B. Austr. i. pl. 14, 15; Müll. Verh. Ethn. p. 21. Lobo (*Müll.*). Mus. Lugd.

4. *Astur? longicaudus*, Garnot, sp.

Falco longicauda, Garnot, Voy. Coq. Zool. i. p. 588. Havre-Dorey (Garn.). Mus. Paris.

STRIGIDÆ.

5. *Spiloglaux humeralis*, H. & J.

Atheus humeralis, H. & J., Voy. au P. S. Zool. iii. p. 53; Atlas, pl. 4. fig. 1; Bp. Consp. p. 40. Mus. Par.

6. *Spiloglaux theomacha*, Bp.

Bp. Compt. Rend. xli. p. (Oct. 22nd, 1855).

CAPRIMULGIDÆ.

7. *Podargus papuensis*, Q. & G.

Voy. Astr. Zool. i. p. 207, pl. 13; Gould, B. Austr. Supp. pt. ii. pl. 7; Müll. Verh. Ethn. p. 21. Havre-Dorey (Q. & G.); P. Marianne's Straits and is. *Aidoema* (Müll.). Mus. Paris.

8. *Podargus ocellatus*, Q. & G.

Voy. Astr. Zool. i. p. 208, pl. 14. Havre-Dorey (Q. & G.). Mus. Par.

HIRUNDINIDÆ.

9. *Hirundo frontalis*, Q. & G.

Voy. Astr. i. p. 204, pl. 12, fig. 1. *H. neoxena*, Gould, B. Austr. ii. pl. 13? Havre-Dorey. Mus. Paris.

CYPSELIDÆ.

10. *Macropteryx mystaceus*, Less., sp.

Cypselus mystaceus, Less. Voy. Coq. Zool. i. p. 647, pl. 22. Havre-Dorey. Mus. Paris.

Specimens of this beautiful Swift in the Leyden Museum are from Amboyna.

CORACIDÆ.

11. *Coracias papuensis*, Q. & G.

Voy. Astr. Zool. i. p. 220, p. 16. Havre-Dorey. Mus. Paris.

This Roller is commonly identified with *Coracias Temminckii*, Vieill. (Le Vaill. Ois. de Par. Suppl. pl. G.), which is from Celebes. Specimens of the latter bird from that island are in the Leyden Museum, and Mr. Wallace has recently transmitted it from the vicinity of Macassar. The two species must be accurately examined and compared before their identity can be considered unquestionable.

ALCEDINIDÆ.

12. *Dacelo Gaudichaudi*, Q. & G.

Voy. Uranie, Ois. pl. 25. *Chouchalcyon gaudichaudi*, Less., Tr. d'Orn. i. p. 248; Müll. Verh. Ethn. p. 22. I. Waigion (Q. & G.); Lobo (Müll.). Mus. Paris., Lugd. et Brit.

13. *Melidora macrorhina*, Less., sp.

Dacelo macrorhinus, Less. Voy. Coq. Zool. i. p. 692, pl. 31 *bis*, fig. 2.
Melidora Euprosia, Less. Tr. d'Orn. p. 249. Havre-Dorey (*Less.*).
 Mus. Par.

14. *Halcyon albicilla*, Less.

Less. Tr. d'Orn. i. p. 247. *H. saurophaga*, Gould. Voy. Sulphur, Zool.
 p. 39, pl. 19. North coast of N. G. (*Hinds*). Mus. Lugd. et Brit.

15. *Halcyon cinnamomeus*, Sw.

Zool. Ill. ser. i. pl. 67; Less. Voy. Coq. Zool. i. p. 696. Havre-Dorey
 (*Less.*). Mus. Lugd.

16. *Halcyon Torotoro*, Less., sp.

Syna Torotoro, Less. Voy. Coq. Zool. i. p. 689, pl. 31 *bis*, fig. 1; Müll.
 Verh. Ethn. p. 22. *Halcyon flavirostris*, Gould, B. Austr. Suppl. pt. i.
 pl. 7?. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Paris. et Lugd.

17. *Tanysiptera Dea*, Linn., sp.

Less. Voy. Coq. Zool. i. p. 697; Müll. Verh. Ethn. p. 22. Havre-
 Dorey (*Less.*); Lobo (*Müll.*). Mus. Paris., Lugd. et Brit.

18. *Alcedo Meninting*, Horsf.

Linn. Trans. xiii. p. 172. *Ceyx Meninting*, Less. Voy. Coq. i. p. 691.
 Havre-Dorey (*Less.*).

Specimens of this bird in the Leyden Museum are from Java and Borneo.
 Lesson's authority for its occurrence in New Guinea is perhaps hardly
 trustworthy.

19. *Alcyone Lessoni*, Cassin.

Pr. Ac. Sc. Phil. 1850, p. 69. *Ceyx azurea*, Less. Voy. Coq. Zool. i.
 p. 690. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd. et Ac. Phil.

20. *Alcyone solitaria*, Temm., sp.

Pl. Col. 595, fig. 2; Müll. Verh. Ethn. p. 22. Lobo (*Müll.*).

21. *Alcyone pusilla*, Temm., sp.

Pl. Col. 595, fig. 3; Müll. Verh. Ethn. p. 22; Gould, B. Austr. ii. pl. 26.
 Lobo (*Müll.*); North Australia. Mus. Lugd.

BUCEROTIDÆ.

22. *Buceros ruficollis*, Vicill.

Temm. Pl. Col. 557; Müll. Verh. Zool. Aves, p. 24, et Ethn. p. 22.
B. plicatus, Less. Tr. d'Orn. i. p. 445. Lobo (*Müll.*); Havre-Dorey (*Less.*).
 Mus. Lugd.

According to Müller, this Hornbill is the only one which extends to New
 Guinea, being also found in Amboyna, Gilolo, Ceram, Rawak and Waigion.
 It appears to have been confounded by Lesson with *Buceros plicatus*, a
 Javan species.

NECTARINIIDÆ.

23. *Nectarinia Eques*, Less.

Voy. Coq. Zool. i. p. 678. pl. 31, fig. 1; Man. d'Orn. pt. ii. p. 45. Havre-Dorey, and Havre d'Offack, Waigion (*Less.*).

Specimens of this bird in the Leyden Museum are from Gilolo.

24. *Nectarinia Zenobia*, Less., sp.

Cinn. Zenobia, Less. Voy. Coq. Zool. i. p. 679, pl. 30. fig. 3. *Cinn. clementiæ*, Less. Man. d'Orn. ii. p. 40. Havre-Dorey (*Less.*).

25. *Nectarinia aspasia*, Less., sp.

Cinn. Aspasia, Less. Voy. Coq. Zool. i. p. 677, pl. 30. fig. 4; Müll. Verh. Ethn. p. 22, et Zool. Aves, p. 58. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd.

26. *Arachnothera Novæ Guineæ*, Less., sp.

Cinn. Novæ Guineæ, Less. Voy. Coq. Zool. i. p. 678; Müll. Verh. Zool. Aves, p. 70. pl. 11. fig. 3. Havre-Dorey (*Less.*); Lobo (*Müll.*).

27. *Dicæum pectorale*, Müll. & Schl.

Verh. Ethn. p. 162 (note). *D. erythrothorax*, Less. Voy. Coq. pl. 30. fig. 1 ? Lobo (*Müll.*). Mus. Lugd.

28. *Melanocharis nigra*, Less., sp.

Dicæum nigrum, Less. Voy. Coq. i. p. 673; Cent. Zool. pl. 27; Müll. Verh. Ethn. p. 162. Havre Dorey (*Less.*); Lobo (*Müll.*). Mus. Lugd.

Müller and Schlegel say this bird is not a *Dicæum*, but a Musciapine, allied to Boie's genus *Hylocharis* (since changed to *Hyloterpe*). It does not seem to me to be referable to either of these genera, but, as far as external appearances go, to be more nearly akin to *Dicæum* than *Hyloterpe*. I have therefore used for it the new generic term *Melanocharis* (*μέλας, niger*, et *χάρις, gratia*). There are examples of both sexes in the Leyden Museum.

MELIPHAGIDÆ.

29. *Ptilotis similis*, Puch.

II. & J. Voy. au P. S. Atlas, pl. 17; Zool. iii. p. 89.

30. *Ptilotis fumata*, Müll. MS.

R. Octanata, N. G. (*Müll.*). Mus. Lugd.

31. *Ptilotis striolata*, Müll. MS.

R. Octanata, N. G. (*Müll.*). Mus. Lugd.

32. *Ptilotis auriculata*, Müll. MS.

Lobo (*Müll.*). Mus. Lugd.

I was not aware, when I examined specimens of these three last species in the Leyden Museum, that they were undescribed, expecting to find them in the 'Verhandeligen,' &c., or I should have taken notes of them. It is not without reluctance that I insert them in my List, as I strongly disapprove of the practice of publishing MS. names without descriptions; but

in the present instance it is important to show the prevalence of this Australian generic form in New Guinea.

33. *Entomophila albigularis*, Gould.

B. Austr. iv. pl. 51. Lobo (Müll.). Mus. Lugd.

34. *Tropidorhynchus mitratus*, Müll. M.S.

T. corniculatus, Müll. Verh. Ethn. p. 21. West coast of New Guinea, R. Oetanata (Müll.). Mus. Lugd.

This is very likely to be the same species as has been lately figured by Mr. Gould as *T. buceroides*, Suppl. B. Austr. p. ii. pl. 17, in which case it ought to bear that name.

35. *Tropidorhynchus chrysotis*, Less., sp.

Philedon chrysotis, Less. Voy. Coq. Zool. i. p. 645, pl. 21 bis. *Myzantha flaviventer*, Less. Man. d'Orn. ii. p. 67. Havre-Dorey (Less.); R. Oetanata (Müll.). Mus. Lugd.

36. *Tropidorhynchus Noræ Guineæ*, Müll. & Schl.

Verh. Ethn. p. 153. West coast of N. G. (Müll.).

TURDIDÆ.

37. *Eupetes Ajax*, Temm.

Pl. Col. 573; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

38. *Eupetes cærulescens*, Temm.

Pl. Col. 574; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

39. *Pitta Noræ Guineæ*, Müll. & Schl.

Verh. Zool. Aves, p. 19. *P. atricapilla*, Q. & G. Voy. Astrol. i. p. 258, pl. 8, fig. 3. Lobo (Müll.); Havre-Dorey (Less.). Mus. Par.

40. *Pitta Mackloti*, Müll. & Schl.

Verh. Zool. Aves, p. 18; Temm. Pl. Col. 547. Lobo (Müll.). Mus. Par. et Lugd.

41. *Pomatorhinus Isidori*, Less.

Voy. Coq. Zool. i. pl. 29, fig. 2. p. 680. *P. Geoffroyi*, G. R. Gray, Gen. B. i. p. 229; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Par. et Lugd.

42. *Brachypteryx murinus*.

Myiothera murina, Müll. MS. Lobo (Müll.). Mus. Lugd. *Turdirostris murina*, Bp. Consp. p. 218.

There are specimens of both sexes of this bird in the Leyden Museum, coloured alike. It seems congeneric with *B. capistratus* (*Myiothera capistrata*, Temm., Pl. Col. 185, fig. 1.), and I have therefore placed it in the genus to which that bird appears to belong. The following is a short description of the present species:—

Supra terricolori-brunneus, cauda rufescentiore, capite laterali cineras-

centiore: subtus ochraceo-rufescens, gutture albo, ventre medio albescente: rostri mandibula superiore nigra, inferiore albicante; pedibus pallidis: long. tota 4.5. poll. angl. et dec.

ORIOLIDÆ.

43. *Mimeta striata*, Q. & G.

Oriolus striatus, Q. & G., Voy. Astr. i. p. 195, pl. 9. fig. 2. *Oriolus melanotis*, Müll. M.S. *Mimeta melanotis*, Bp. Consp. p. 346. Havre-Dorey (Q. & G.). New Guinea and Timor. Mus. Lugd.

44. *Mimeta Mulleri*, Bp.

Consp. p. 346. *Oriolus viridissimus*, Temm. MS. Mus. Lugd.

45. *Xanthomelus aureus*, Linn., sp.

Oriolus aureus, Linn., Le Vaill. Paradis. pl. 18. *Sericulus aureus*, auct. et Bp. Consp. p. 349. Gen. *Xanthomelus*, Bp. Notes Orn. p. 75. Mus. Paris., Lugd. et Brit.

46. *Melanopyrrhus anais*, Less., sp.

Sericulus anais, Less. Rev. Zool. 1839, p. 44. Gen. *Melanopyrrhus*, Bp. Notes Orn. p. 9. *Pastor nigro-cinctus*, Cassin, Pr. Ac. Sc. Phil. 1850, p. 68. Mus. Paris. et Acad. Phil.

CAMPEPHAGIDÆ.

47. *Artamus papuensis*, Bp.

Consp. p. 344. *Ocypterus leucorhynchus*, Müll. Verh. Ethn. p. 21. R. Octanata (Müll.). Mus. Lugd.

48. *Graucalus Desgrazii*, Puch.

H. & J. Voy. au P. S. pl. 7, fig. 1; Zool. iii. p. 64. Mus. Paris.

49. *Graucalus melanops*, Lath., sp.?

Müll. Verh. Ethn. p. 190; Gould, B. Austr. ii. pl. 55. West coast of N. G. (Müll.). Mus. Lugd.

There are specimens of a *Graucalus* in the Leyden Museum from New Guinea and Amboyna which are there considered to be the same as this Australian species, but I doubt the correctness of this reference.

50. *Graucalus larvatus*, Müll. & Schl.

Ceblepyris larvata, Verh. Ethn. p. 190. Mus. Lugd.

The specimens of this bird in the Leyden Museum are some of them marked "New Guinea," but Müller and Schlegel give Java as the correct habitat.

53. *Graucalus papuensis*, Gm., sp.

Corvus papuensis, Gm. S. N. i. p. 371; Müll. Verh. Ethn. p. 191. Lobo (Müll.). Mus. Lugd. et Par.

Also in the Leyden Museum from the Banda Is., Ternate and Celebes.

54. *Ptiladela Boyeri*, Puch.

Voy. au P. S. pl. 9. fig. 3; Zool. iii. p. 68. West coast of N. G. Mus. Paris.

55. *Campephaga schisticeps*, Puch.

Ceblepyris schisticeps, Puch. Voy. au P. S.; Zool. iii. p. 70, pl. 10. fig. 1. West coast of N. G. Mus. Par.

56. *Campephaga plumbea*, Müll. & Schl.

Ceblepyris plumbea, Müll. & Schl. Verh. Ethn. p. 189. R. Octanata (Müll.). Mus. Lugd.

57. *Edoliisoma melan*, Müll. & Schl., sp.

Ceblepyris melas, Müll. & Schl. Verh. Ethn. p. 189 (♂), et *C. cinnamomea*, ibid. (♀): *E. marescoti*, Puch. Voy. au P. S., Zool. iii. p. 70, pl. 10. fig. 2. West coast of N. G. (H. & J.); Lobo (Puch.). Mus. Par. et Lugd.

58. *Dicrurus megarhynchus*, Q. & G., sp.

Edolius megarhynchus, Q. & G., Voy. Astrol. Zool. i. p. 184, pl. 6. Havre-Dorey (Q. & G.). Mus. Paris.

59. *Dicrurus carbonarius*, Müll. MS.

Bp. Consp. p. 352. Lobo (Müll.). Mus. Lugd.

EURYLEMIDÆ.

60. *Peltops Blainvillii*, Garn., sp.

Eurylaimus Blainvillei, Garn. Voy. Coq. i. p. 595, pl. 19; Bp. Consp. p. 169. Havre-Dorey (Garn.). Mus. Paris.

MUSCICAPIDÆ.

61. *Arses chrysomela*, Less., sp.

Muscicapa chrysomela, Less. Voy. Coq. i. pl. 18. fig. 2; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

62. *Arses telescopthalma*, Garn., sp.

Muscicapa telescopthalma, Garn. Voy. Coq. i. p. 593, pl. 18. fig. 1; Müll. Verh. Ethn. p. 22. Havre-Dorey (Garn.). Lobo (Müll.). Mus. Par. et Lugd.

63. *Monarcha guttula*, Garn., sp.

Musc. guttula, Garn. Voy. Coq. Ois. pl. 16. fig. 2. p. 591; Bp. Consp. i. p. 326. Havre-Dorey. Mus. Par.

64. *Monarcha inornata*, Garn., sp.

Musc. inornata, Garn. Voy. Coq. Ois. pl. 16. fig. 1. p. 591. Havre-Dorey (Garn.).

65. *Todopsis cyanocephala*, Q. & G., sp.

Todus cyanocephalus, Q. & G., Voy. Astrol. i. p. 227, pl. 5, fig. 4; Voy. au P. S. pl. 20. fig. 2; Zool. iii. p. 79. Gen. *Todopsis*, Bp. Notes Orn. p. 80. Havre-Dorey (Q. & G.). Mus. Paris.

66. *Tchitrea Enado*, Less., sp.
M. Enado, Less., Voy. Coq. i. p. 643, pl. 15. fig. 2. Havre-Dorey (*Less.*).
67. *Tchitrea Gaimardi*, Less., sp.
M. Gaimardi, Less., Trait. d'Orn. i. p. 386.
68. *Rhipidura threnothorax*, Müll. & Schl.
 Verh. Ethn. p. 185. Lobo (*Müll.*).
69. *Rhipidura rufiventris*, Müll. & Schl.
 Verh. Ethn. p. 185. Lobo (*Müll.*).
70. *Rhipidura gularis*, Müll. & Schl.
 Verh. Ethn. p. 185. Lobo, R. Octanata and P. Marianne's Straits (*Müll.*).

LANIIDÆ.

71. *Ptererythrius spinicaudus*, Puch.
 Voy. au P. S. Zool. iii. p. 58, pl. 6. fig. 2. Gen. *Pucherania*, Bp. Notes Orn. p. 73. Warrior's Is., Torres Straits (*H. & J.*). Mus. Paris.
72. *Pachycephala lugubris*, Müll. MS.
 R. Octanata (*Müll.*). Mus. Lugd.
73. *Pachycephala virescens*, Temm. MS.
 Lobo (*Müll.*). Mus. Lugd.
74. *Myiolestes megarhynchus*, Q. & G., sp.
Muscicapa megarhyncha, Q. & G., Voy. Astrol. i. pl. 3. fig. 1, p. 172; Bp. Consp. i. p. 358. *Napothera elaeioides*, Müll. M.S. Havre-Dorey (Q. & G.). Mus. Lugd.
75. *Myiolestes pulverulentus*, Müll. MS.
 Bp. Consp. p. 358. Mus. Lugd.
76. *Rectes cirrhocephalus*, Less., sp.
Vanga kirrhocephalus, Less. Voy. Coq. i. p. 633, pl. 11. *Timalia poliocephala*, Müll. MS. Havre-Dorey (*Less.*); Lobo (*Müll.*). Mus. Par. et Lugd.
77. *Rectes dichrous*, Bp., sp.
 Compt. Rend. xxxi. p. 563. *Garrulax bicolor*, Müll. MS. Lobo (*Müll.*). Mus. Lugd.
- ♂ et ♀ similis. Saturate rufo-cinnamomeus, abdomine dilutiore; capite cristato toto cum gutture, cervice, alis et cauda nigerrimis; rostro et pedibus nigris: long. tota 8·5, alæ 3·75, eandæ 3·6, poll. angl. et dec.
78. *Rectes strepitans*, Puch., sp.
 H. & J. Voy. au P. S. Ois. pl. 6. fig. 1; Zool. iii. p. 60. *Rectes ferru-*

gineus, Bp. Compt. Rend. xxxi. p. 563. West Coast of N. G. (*H. & J.*); Lobo (*Müll.*). Mus. Paris. et Lugd.

79. *Cracticus cassicus*, Bodd., sp.

Pl. Enl. 628; unde *Ramphastos cassicus*, Bodd., et *Coracias varia*, Gm., *Barita Souuerati*, Less. Trait. d'Orn. i. p. 346. *Barita varia*, Müll. Verh. Ethn. p. 22. Lobo (*Müll.*). Mus. Paris.

80. *Cracticus personatus*, Temm. MS.

Albus, plaga dorsi medii et capite toto cum gutture et pectore nigerrimis; alis caudaque nigris, secundariarum pogoniis externis et rectricum apicibus albis; rostri cærulescenti-plumbei basi alba, pedibus nigris. Long. tota 11·5, alæ 6·7, caudæ 4·6 poll. angl. et dec.

Lobo (*Müll.*). Mus. Lugd. Nearly allied to *C. picatus* (Gould B. Austr. ii. pl. 50). Perhaps not different from the former species.

81. *Cracticus Quoyi*, Less., sp.

Barita Quoyi, Less. Voy. Coq. i. p. 639; Gould, B. Austr. ii. pl. 53. Havre-Dorey (*Less.*). Mus. Par. et Brit.

CORVIDÆ.

82. *Gymnocorvus senex*, Less., sp.

Corvus senex, Less. Voy. Coq. i. p. 651, pl. 24. *Gymnocorvus tristis*, Less. Tr. d'Orn. i. p. 327. Havre-Dorey (*Less.*). Mus. Paris.

83. *Corvus Orru*, Bp.

Consp. i. p. 385. Havre-Dorey (*Less.*). Mus. Paris.

PARADISEIDÆ.

84. *Manucodia chalybea*, Bodd.

Pl. Enl. 634; unde *Manucodia chalybea*, Bodd.: Sonn. Voy. Nouv. Guin. pl. 100, unde *Paradisea viridis*, Scop. *Phouygama viridis*, G. R. Gray, et Bp. Consp. i. p. 368; Müll. Verh. Ethn. p. 22. Havre-Dorey (*Less.*); Lobo (*Müll.*).

85. *Manucodia Keraudreni*, Less., sp.

Barita Keraudreni, Less. Voy. Coq. i. p. 636, pl. 13. *Chalybæus cornutus*, Cuv. *Phouygama Lessonia*, Sw. Havre-Dorey (*Less.*). Mus. Paris. et Lugd.

86. *Manucodia atra*, Less.

Phouygama atra, Less. Voy. Coq. i. p. 639. Havre-Dorey (*Less.*).

87. *Paradisea apoda*, Linn.

Less. Voy. Coq. i. p. 526. Aroo Isl. (*Lesson*). Mus. Par., Lugd. et Brit.

Mr. Wallace also has lately found this bird abundant at the Aru Isl. I am not aware of its having been observed alive upon the mainland of New Guinea.

88. *Paradisea papuana*, Beechst.

Less. Voy. Coq. i. p. 446; Müll. Verh. Ethn. p. 70; Bp. Consp. i. p. 413. Havre-Dorey (*Less.*); Lobo and r. Oetanata (*Müll.*). Mus. Par. et Lugd.

89. *Paradisea rubra*, Daud.

Bp. Consp. i. p. 443; Less. Voy. Coq. i. p. 662. Waigiu (*Less.*). Mus. Par. et Lugd.

90. *Diphyllodes speciosa*, Bodd., sp.

Pl. Enl. 631, unde *P. speciosa*, Bodd.: Sonn. Voy. Nouv. Guin. pl. 98, unde *P. magnifica*, Scop. Less. Voy. Coq. i. p. 446. Mus. Paris. et Lugd.

Skins of this bird were obtained by Lesson and Garnot from the natives at Havre-Dorey, but we have no record of its being found alive.

91. *Diphyllodes Wilsoni*, Cassin.

Lophorina respublica, Bp. Compt. Rend. 1850, p. 131, et Compt. Rend. 1850, p. 291. *D. respublica*, Bp. Consp. p. 413. *Paradisea Wilsoni*, Cassin, Pr. Ac. Se. Phil. 1850, p. 57; Trans. Ac. Phil. Mus. Acad. Philadelph., specimen unicum!

In the 'Proceedings of the Zoological Society' for this year (p. 6), I have stated my reasons for preferring Mr. Cassin's name to Prince Bonaparte's for this bird.

92. *Cicinnurus regius*, Linn.

P. regia, Linn., Bp. Consp. i. p. 413; Müll. Verh. Ethn. p. 22; Less. Voy. Coq. i. p. 658. Havre-Dorey (*Less.*); Lobo and r. Oetanata (*Müll.*); Arn Isl. (*Wallace*). Mus. Par. et Lugd.

93. *Lophorina atra*, Bodd.

Pl. Enl. 632, unde *P. atra*, Bodd.: Sonn. Voy. Nouv. pl. 96, unde *P. superba*, Scop., Bp. Consp. p. 414. Mus. Paris. et Lugd.

Lesson obtained skins of this species from the natives at Havre-Dorey.

94. *Parotia searpennis*, Bodd., sp.

Pl. Enl. 633; unde *P. searpennis*, Bodd.; *Parotia aurea*, Bp. Consp. p. 414. Mus. Paris. et Lugd.

EPIMACHIDÆ.

95. *Seleucides albus*, Blum., sp.

Bp. Consp. p. 412. Mus. Paris. et Lugd.

96. *Epimachus maximus*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 101; unde *Merops maximus*, Scop., Bp. Consp. p. 412; *Epimachus filamentosus*, Müll. Verh. Ethn. p. 22. Lobo (*Müll.*). Mus. Lugd. et Paris.

97. *Ptilorhis magnifica*, Vieill., sp.

Craspedophora magnifica, Bp. Consp. p. 412; Gould, Suppl. B. Austr. Mus. Paris., Lugd. et Acad. Philadelph.

When examining the specimens of this bird contained in the magnificent collection of the Academy of Natural Sciences of Philadelphia, I noticed considerable differences between the Australian and New Guinea examples. In the former, the pectoral patch seemed to be broader and terminated below in a semi-circular form, in the latter to be much narrower and nearly straight in its lower margin.

STURNIDÆ.

98. *Paradigalla carunculata*, Less.

Rev. Zool. 1840, p. 1; Voy. Bonite, Ois. pl. 1; Bp. Consp. p. 414; Mus. Paris. et Acad. Philadelph.

99. *Astrapia nigra*, Gm., sp.

Bp. Consp. p. 414. Mus. Paris. et Lugd.

100. *Calornis metallica*, Temm.

Pl. Col. 266. *Calornis Cantor*, Müll. Verh. Ethn. p. 21. Lobo (Müll.). Mus. Lugd.

101. *Gracula Dumonti*, Less., sp.

Mino Dumontii, Less. Voy. Coq. i. p. 653, pl. 25; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Lugd. et Paris.

PSITTACIDÆ.

102. *Aprosmictus amboinensis*, Linn.

Psitt. amboinensis, Linn. S. N. i. p. 141; Pl. Enl. 240. *P. dorsalis*, Q. & G. Voy. Astrol. i. p. 234, pl. 21, fig. 2; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

103. *Cyanorhamphus Novæ Guineæ*, Bp.

Consp. Psitt. in Cabanis' Journ. f. Orn.

Prince Bonaparte has included this name in his "Table of Parrots," but I am not aware that he has published any description of the bird.

104. *Trichoglossus cyanogrammus*, Wagl.

Wagl. Mou. Psitt. p. 554; Müll. Verh. Ethn. p. 108. West coast of N. G. (Müll.). Mus. Lugd.

105. *Trichoglossus placens*, Temm., sp.

Psitt. placentis, Temm. Pl. Col. 553; Müll. Verh. Ethn. p. 23. R. Octanata (Müll.). Mus. Lugd.

106. *Charmosyna papuana*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 111. *Psitt. Papua*, Scop. *Psitt. Papuensis*, Gm. Less. Voy. Coq. i. p. 630; Müll. Verh. Ethn. 107. Havre-Dorey (Less.). Mus. Paris. et Lugd.

107. *Lorius domicella*, Linn.

Less. Voy. Coq. i. p. 627. Havre-Dorey (Less.). Mus. Paris. et Lugd.

108. *Lorius tricolor*, Stephens.

Pl. Enl. 168. *Psitt. Lory*, Less. Voy. Coq. i. p. 628. Havre-Dorey (Less.). Mus. Paris.

109. *Eos squamata*, Bodd., sp.

Pl. Enl. 684; unde *Psitt. squamatus*, Bodd. *Psitt. Guebiensis*, Less. Voy. Coq. i. p. 628. Havre-Dorey et Guebé (Less.). Mus. Paris. et Lugd.

110. *Chalcopsitta atra*, Scop., sp.

Sonn. Voy. Nouv. Guin. pl. 110; unde *Psitt. ater*, Scop.; *Psitt. Novæ Guineæ*, Gm., Bp. P. Z. S. Mus. Lugd.

111. *Chalcopsittu scintillans*, Temm., sp.

Pl. Col. 569; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd. et Paris.

The specimens of this bird in the Paris Museum were obtained at the Aru Isl. by MM. Hombron and Jacquinot.

112. *Eclectus cardinalis*, Bodd., sp.

Pl. Enl. 518; unde *Psitt. cardinalis*, Bodd., et *Psitt. puniceus*, Gm. *Eclectus puniceus*, Bodd. Pr. Z. S. 1849, p. 143; Less. Voy. Coq. i. p. 627. *Eclectus grandis*, Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.).

113. *Polychlorus grandis*, Gm., sp.

Sonn. Voy. Nouv. Guin. pl. 108; unde *Psitt. polychloros*, Scop., et *Psitt. grandis*, Gm. *Psitt. Sinensis*, Less. Voy. Coq. i. p. 627. *Eclectus polychloros*, Müll. Verh. Ethn. p. 22. Gen. *Polychlorus*, Scclater in P. Z. S. 1857, p. 226. Lobo (Müll.); Havre-Dorey (Less.). Mus. Paris. et Lugd.

114. *Psittacodis Stavorini*, Less., sp.

Wagler, Mon. Psitt. p. 574, pl. 53. *Psitt. Stavorini*, Less. Voy. Coq. i. p. 628. I. Waigiou (Less.).

115. *Geoffroius personatus*, Shaw, sp.

Psitt. batavensis, Gm.; Müll. Verh. Ethn. p. 22, et *Psitt. Geoffroyi*, ibid. p. 107. Lobo (Müll.).

116. *Geoffroius Pucherani*, Bp.

Pionus fuscicapillus, Puch. Voy. au P. S. Zool. pl. 3, p. 111, pl. 25 bis, fig. 3. West coast of N. G. (H. & J.). Mus. Paris.

117. *Cyclopsitta Desmaresti*, Garn., sp.

Voy. Coq. i. p. 600, pl. 35; Müll. Verh. p. 22. Havre-Dorey (Garn.); Lobo (Müll.). Mus. Par. et Lugd.

118. *Cyclopsitta diophthalma*, H. & J., sp.

Ann. d. Sc. Nat. sér. ii., xvi. p. 313; Voy. au P. S. pl. 25*. fig. 4 et 5; et Zool. iii. p. 107. S. coast of N. G. Mus. Par.

119. *Nasiterna pygmæa*, Q. & G., sp.

Psitt. pygmæus, Q. & G. Voy. Astrol. i. p. 232, pl. 21. *Micropsitta pygmæa*, Less. Tr. d'Orn. p. 646; Müll. Verh. Ethn. pp. 23 et 107. Havre-Dorey (Q. & G.); r. Oetanata (Müll.).

120. *Cacatua Triton*, Temm.

Comp d'œil, s. l. Poss. Néd. iii. p. 405. *P. galeritus*, Less. Voy. Coq. i. p. 624, et Müll. Verh. p. 21. Havre-Dorey (Less.); west coast of N. G. (Müll.). Mus. Lugd.

This species is very nearly allied to the *C. galerita* of Australia. Mr. Gould (B. Austr. vol. v. p. 1) seems to consider it as hardly different.

121. *Cacatua æquatorialis*, Temm.

Coup d'œil s. l. Poss. Néd. iii. p. 405. *C. sulphurea*, Less. Voy. Coq. i. p. 625. Havre-Dorey (Less.). Mus. Lugd.

122. *Microglossa aterrima*, Gm., sp.

Less. Voy. Coq. i. p. 625. *Psitt. Goliath*, Müll. Verh. Ethn. p. 22; Gould, B. Austr. suppl. pt. i. pl. 5. Havre-Dorey et Waigiou (Less.); Lobo (Müll.). Mus. Paris. et Lugd.

123. *Microglossa Alecto*, Temm.

Bp. Consp. i. p. 7. Mus. Lugd.

CUCULIDÆ.

124. *Centropus Meuebeki*, Garn.

Voy. Coq. i. p. 600, pl. 3; Müll. Verh. Ethn. p. 22. Havre-Dorey (Less.); Lobo (Müll.).

125. *Eudynamys rufiventris*, Less., sp.

Cuculus rufiventer, Less. Voy. Coq. i. pl. 623. Havre-Dorey (Less.). Mus. Paris.

126. *Hierococcyx leucolophus*, Müll. & Schl.

Verh. Ethn. pp. 22 et 233. Lobo (Müll.). Mus. Lugd.

127. *Chrysococcyx lucidus*, Gm.

Müll. Verh. p. 21; Bp. Consp. p. 106; Gould, B. Austr. iv. pl. 39. Lobo (Müll.).

COLUMBIDÆ.

128. *Goura coronata*, Linn.

Bp. Consp. ii. p. 96; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd. et Brit.

129. *Goura Victoriae*, Fraser.

Bp. Consp. ii. p. 96. *G. Steursii*, Temm. Mus. Lugd. et Brit.

130. *Calenas nicobarica*, Linn., sp.

Bp. Consp. ii. p. 95; Less. Voy. Coq. ii. p. 145.

131. *Ptilonopus viridis*, Linn., sp.

Bp. Consp. ii. p. 24; Knip, Pig. pl. 17; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

132. *Ptilonopus Lechlancheri*, Bp., sp.

Trerolæma Lechlancheri, Bp. Compt. Rend. xli. p. 247. Mus. Paris. et Brit.

133. *Ptilonopus cyanovirens*, Less., sp.

Bp. Consp. ii. p. 23; Less. Voy. Coq. i. p. 713. pl. 42. Havre-Dorey (Less.). Mus. Paris.

134. *Ptilonopus perlatus*, Temm., sp.

Pl. Col. 559; Bp. Consp. ii. p. 40; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

135. *Ptilonopus naina*, Temm., sp.

Pl. Col. 565; Bp. Consp. ii. p. 25; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

136. *Ptilonopus pulchellus*, Temm., sp.

Pl. Col. 564; Bp. Consp. ii. p. 22; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

137. *Ptilonopus superbus*, Temm., sp.

Bp. Consp. ii. p. 18; Gould, B. Austr. v. pl. 57; Müll. Verh. Ethn. p. 22. Lobo (Müll.). Mus. Lugd.

138. *Carpophaga myristicivora*, Scop., sp.

Bp. Consp. ii. p. 31; Sonn. Voy. Nouv. Guin. pl. 102; unde *C. myristicivora*, Scop. New Guinea (Scop.).

139. *Carpophaga bicolor*, Scop., sp.

Sonn. Voy. N. Guin. pl. 103. unde *C. bicolor*, Scop.; Bp. Consp. ii. p. 36. New Guinea (Sonn.). Mus. Brit.

142. *Carpophaga luctuosa*, Temm., sp.

Pl. Col. 247; Gould, B. Austr. v. pl. 60; Bp. Consp. ii. p. 36. New Guinea (Belcher). Mus. Brit.

143. *Carpophaga Mülleri*, Temm., sp.
Pl. Col. 566; Müll. Verh. Ethn. p. 23. R. Octanata (Müll.). Mus. Lugd.
144. *Carpophaga Piuon*, Q. & G., sp.
Col. *Piuon*, Q. & G., Voy. Uranie, pl. 28. p. 118; Bp. Consp. ii. p. 37.
I. Rawak (Q. & G.). Mus. Paris.
145. *Carpophaga Zoea*, Less., sp.
Col. *Zoea*, Less. Voy. Coq. pl. 39. p. 705; Bp. Consp. ii. p. 38. Havre-Dorey (Less.). Mus. Paris.
146. *Carpophaga rufigastra*, Q. & G., sp.
Voy. Astrol. pl. 27, p. 245; Bp. Consp. ii. p. 38. Havre-Dorey (Q. & G.). Mus. Paris.
147. *Carpophaga puella*, Less., sp.
Col. *puella*, Less. Man. d'Orn. p. 172; Bp. Consp. ii. p. 40; Müll. Verh. Ethn. p. 22. R. Octanata (Müll.). Mus. Lugd. et Brit.
148. *Macropygia Doreya*, Bp.
Consp. ii. p. 57. Mus. Paris.
149. *Geopelia humeralis*, Temm., sp.
Pl. Col. 191; Gould, B. Austr. v. pl. 72; Bp. Consp. ii. p. 93. Lobo (Müll.). Mus. Lugd. et Brit.
150. *Chalcophaps Stephani*, Puch.
Voy. au P. S. pl. 28. fig. 2; Zool. iii. p. 119; Bp. Consp. ii. p. 93. West coast of N. G. (H. & J.); Lobo (Müll.). Mus. Paris. et Lugd.
151. *Eutrygon terrestris*, Puch., sp.
Trugon terrestris, Puch. Voy. au P. S. Zool. iii. p. 123. pl. 28, fig. 1; Bp. Consp. ii. p. 86. West coast of N. G. (H. & J.). Mus. Paris.
I have slightly modified the generic name of this peculiar type, *Trugon*, correctly written *Trygon* (τρυγών), having been previously used for another division by Prof. Reichenbach.

STRUTHIONIDÆ.

152. *Casuarius Emeu*, Lath., sp.
Less. Voy. Coq. i. p. 717; Müll. Verh. Ethn. p. 109. Havre-Dorey (Less.); S.W. coast (Müll.).

MEGAPODIDÆ.

153. *Tahgulla Cuvieri*, Less.
Voy. Coq. i. p. 715, pl. 38. Havre-Dorey (Less.).

154. *Megapodius rubripes*, Temm.

Pl. Col. 411; Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.). Mus. Lugd.

155. *Megapodius Freycineti*, Q. & G.

Voy. Uranie, Ois. pl. 32, p. 125. Isl. Waigiau and Guebé (H. & J.).

156. *Megapodius Duperreii*, Less.

Voy. Coq. i. p. 700. pl. 36. Havre-Dorey (Less.).

There appears to be much confusion among the true *Megapodii*. In the Leyden Museum there are specimens of four distinct species:—1. *M. Freycineti*, ex Ternate (Forster); 2. *rubripes*, ex Nov. Guinea et Celebes; 3. *tumulus*, ex Australia; and 4. an undescribed species from Ceram.

CHARADRIIDÆ.

157. *Esacus magnirostris*, G. S. Hilaire, sp.

Temm. Pl. Col. 387; Gould, B. Austr. vi. pl. 6. R. Oetanata (Müll.). Mus. Lugd.

158. *Hiaticula inornata*, Gould.

B. Austr. vi. pl. 19. Oomaga Is., Torres Straits (Lieut. Ince); coast of N. G. (Gould).

159. *Glareola Isabella*, Vieill.

G. grallaria, Temm.; Gould, B. Austr. vi. pl. 22; Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.). Mus. Lugd.

160. *Hæmatopus longirostris*, Vieill.

Gould, B. Austr. vi. pl. 7. *H. ostralegus*, Müll. Verh. Ethn. p. 21? Coasts of N. G. (Müll.).

161. *Streptilas interpres*, Linn., sp.

Raines Islets, Torres Straits (Gould).

ARDEIDÆ.

162. *Herodias Novæ Guineæ*, Gm., sp.

Bp. Consp. ii. p. 121. Mus. Paris.

163. *Botaurus heliosylus*, Less.

Voy. Coq. Zool. i. p. 722. pl. 44; Bp. Consp. ii. 136. Havre-Dorey (Less.). Mus. Paris.

SCOLOPACIDÆ.

164. *Himantopus leucocephalus*, Gould.

B. Austr. vi. pl. 7; Müll. Verh. Ethn. p. 21. Coasts of N. G. (Müll.).

165. *Numenius uropygialis*, Gould.

B. Austr. vi. pl. 43. *N. phæopus*, Müll. Verh. Ethn. p. 22? Coasts of N. G. (Müll.).

166. *Schæniclus albescens*, Gould.

B. Austr. vi. pl. 31. *Tringa pusilla*, Müll. Verh. Ethn. p. 23. R. Oetanata (Müll.).

167. *Tringoides empusa*, Gould, sp.

Actitis empusa, Gould, B. Austr. vi. pl. 35. *T. hypoleucus*, Müll. Verh. Ethn. p. 22. Coasts of N. G. (Müll.).

RALLIDÆ.

168. *Parra gallinacea*, Temm.

Pl. Col. 427; Gould, B. Austr. vi. pl. 25.

LARIDÆ.

169. *Sterna melanauchen*, Temm.

Pl. Col. 427; Gould, B. Austr. vii. pl. 28; Müll. Verh. Ethn. p. 125. Coast of N. G. (Müll.).

170. *Sterna velox*, Rüpp.?

Müll. Verh. Ethn. p. 125. West coast of N. G. (Müll.).

ERRATA.

Page 58, line 3, for FORMICA IRRITANS read FORMICA HOSTILIS.

— 101, erase under PELOPÆUS JAVANUS, the habitat Borneo. The species from Borneo is described in the paper on the Hymenoptera of Celebes, and named *Pelopæus benignus*.

INDEX.

	PAGE
<i>Aecentor</i>	137
<i>Agathis</i> , <i>Latr.</i>	127
— <i>planipennis</i> , <i>Brullé</i>	127
<i>Agema</i> (Subgen.), <i>Schiödt</i> . . .	94
— <i>Atalanta</i> , <i>Sm.</i>	94
— <i>Egina</i> , <i>Sm.</i>	94
— <i>blanda</i> , <i>Guér.</i> (sp.)	94
— <i>Daphne</i> , <i>Sm.</i>	95
— <i>Laverna</i> , <i>Sm.</i>	95
— <i>Melampus</i> , <i>Sm.</i>	95
— <i>flavopicta</i> , <i>Sm.</i>	96
— <i>Hippolyte</i> , <i>Sm.</i>	96
— <i>Celeno</i> , <i>Sm.</i>	96
<i>Alcedinidæ</i>	155
<i>Alcedo</i>	156
<i>Aleyone</i>	156
<i>Ampelis</i>	134
<i>Ampulex</i> , <i>Jurine</i>	98
— <i>hospes</i> , <i>Sm.</i>	98
— <i>compressa</i> , <i>Sm.</i>	99
— <i>smaragdina</i> , <i>Sm.</i>	99
— <i>insularis</i> , <i>Sm.</i>	99
<i>Andrenidæ</i> , <i>Leach</i>	42
<i>Andrenoides</i>	44
<i>Anthophora</i> , <i>Latr.</i>	48
— <i>zonata</i> , <i>Linn.</i> (sp.)	48
— <i>insularis</i> , <i>Sm.</i>	48
<i>Apis</i> , <i>Linn.</i>	49
— <i>dorsata</i> , <i>Fabr.</i>	49
— <i>indica</i> , <i>Fabr.</i>	49
— <i>Perrottetii</i> , <i>Guér.</i>	49
— <i>Andreniformis</i> , <i>Sm.</i>	49
— <i>testacea</i> , <i>Sm.</i>	49
— <i>thoracica</i> , <i>Sm.</i>	50
— <i>nitidiventris</i> , <i>Sm.</i>	50
— <i>læviceps</i> , <i>Sm.</i>	51
— <i>apicalis</i> , <i>Sm.</i>	51
— <i>canifrons</i> , <i>Sm.</i>	51
— <i>collina</i> , <i>Sm.</i>	51
— <i>fimbriata</i> , <i>Sm.</i>	52
<i>Aprosmictus</i>	163
<i>Arachnothera</i> <i>Novæ Guinææ</i> , <i>Less.</i> (sp.)	157
<i>Archencephala</i>	20
<i>Arleidæ</i>	169
<i>Arses</i>	160
<i>Artamus</i>	159
<i>Artiodactyla</i>	27
<i>Astrapia</i>	164
<i>Astur</i>	154, 155
<i>Atta</i> , <i>Latr.</i>	77

	PAGE
<i>Atta penetrans</i> , <i>Sm.</i>	77
— <i>cingulata</i> , <i>Sm.</i>	67
<i>Belidea</i>	154
<i>Bembex</i> , <i>Fabr.</i>	105
<i>Bembicidæ</i> , <i>Westw.</i>	105
— <i>melancholica</i> , <i>Sm.</i>	105
<i>Botaurus</i>	169
<i>Brachypteryx murinus</i>	158
<i>Bracon</i> , <i>Fabr.</i>	122
— <i>aculeator</i> , <i>Fabr.</i>	122
— <i>quadriceps</i> , <i>Sm.</i>	122
— <i>suspiciosus</i> , <i>Sm.</i>	123
— <i>insignis</i> , <i>Sm.</i>	123
— <i>cephalotes</i> , <i>Sm.</i>	123
— <i>perplexus</i> , <i>Sm.</i>	124
— <i>vagatus</i> , <i>Sm.</i>	124
— <i>inquietus</i> , <i>Sm.</i>	124
— <i>rugifrons</i> , <i>Sm.</i>	125
— <i>floralis</i> , <i>Sm.</i>	125
— <i>vultuosus</i> , <i>Sm.</i>	125
— <i>foveatus</i> , <i>Sm.</i>	126
— <i>laboriosus</i> , <i>Sm.</i>	126
— <i>crassipes</i> , <i>Sm.</i>	126
<i>Braconidæ</i> , <i>Westw.</i>	122
<i>Bruta</i>	23
<i>Buceonidæ</i>	133
<i>Buceros</i>	156
<i>Bucerotidæ</i>	156
<i>Cacatua</i>	166
<i>Cærebidæ</i>	133
<i>Calænas</i>	167
<i>Calornis</i>	164
<i>Campephaga</i>	160
<i>Campephagidæ</i>	159
<i>Caprimulgidæ</i>	155
<i>Carnivora</i>	31
<i>Carpophaga</i>	167
<i>Casuarus</i>	168
<i>Cataulacus</i> , <i>Sm.</i>	80
— <i>insularis</i> , <i>Sm.</i>	80
— <i>horridus</i> , <i>Sm.</i>	81
— <i>reticulatus</i> , <i>Sm.</i>	81
<i>Centropus</i>	166
<i>Cerapachys</i> , <i>Sm.</i>	74
— <i>antennatus</i> , <i>Sm.</i>	74
— <i>oculatus</i> , <i>Sm.</i>	74
<i>Ceratina</i> , <i>Latr.</i>	47
— <i>hieroglyphica</i> , <i>Sm.</i>	47
— <i>flavopicta</i> , <i>Sm.</i>	47
<i>Cerceris</i> , <i>Latr.</i>	107
— <i>sepuleralis</i> , <i>Sm.</i>	107

	PAGE
Certhia	134
Cetacea	26
Chalcididae, <i>Walker</i>	127
Chalcophaps	168
Chalcopsitta	165
Charadriidae	169
Charmosyna	165
Cheiroptera	23
Chrysididae, <i>Leach</i>	128
Chrysis, <i>Linm.</i>	128
— malachitica, <i>Sm.</i>	128
— vestigator, <i>Sm.</i>	128
Chrysococcyx	166
Cicimurus	163
Coliidae	133
Columbidae	167
Coracias	155
Coraciidae	155
Corvidae	162
Corvus	162
Cotingidae	133
Cotyle	134
Crabro, <i>Fabr.</i>	106
— familiaris, <i>Sm.</i>	106
— rugosus, <i>Sm.</i>	106
Crabronidae, <i>Leach</i>	105
Cracidae	133
Cracticus	161
Crematogaster, <i>Lund</i>	75
— anthracinus, <i>Sm.</i>	75
— brunneus, <i>Sm.</i>	75
— cephalotes, <i>Sm.</i>	75
— obscurus, <i>Sm.</i>	76
— inflatus, <i>Sm.</i>	76
— difformis, <i>Sm.</i>	76
Cryptoceridae (Subfam.)	79
Cryptus, <i>Fabr.</i>	118
— erocipes, <i>Sm.</i>	118
— elegans, <i>Sm.</i>	118
— lepidus, <i>Sm.</i>	119
Ctenoplectra, <i>Smith</i>	44
— chalybea, <i>Sm.</i>	45
Cuculidae	166
Cuscus	21, 154
Cyanorhamphus	164
Cyclopsitta	166
Cynipidae, <i>Westw.</i>	117
Cynips insignis, <i>Sm.</i>	117
Cypselidae	155
Dacelo	155
Dasygastre (Subfam.)	45
Dendrocolaptidae	133
Dendrolagus	154
Dicaeum	157
Dierurus	160
Didelphes	10
Didelphys	21
Diphyllodes	163
Dorcopsis (sp.)	154
Echinopla, <i>Sm.</i>	79

	PAGE
Echinopla melanaretos, <i>Sm.</i>	79
— pallipes, <i>Sm.</i>	80
— striata, <i>Sm.</i>	80
Eclectus	165
Edolisoma	160
Entomophila	158
Eos	165
Epimachidae	163
Epinaclus	163
Epistenia, <i>Westw.</i>	127
— imperialis, <i>Sm.</i>	127
Erythacus	137
Esacus	169
Eudynamys	166
Eumenes	108
— flavopieta, <i>Blanch.</i>	108
— Blanchardi, <i>Sauss.</i>	108
— quadrispinosa, <i>Sauss.</i>	108
— xanthura, <i>Sauss.</i>	108
— hemorrhoidalis, <i>Fabr.</i> (sp.)	109
— quadrata, <i>Sm.</i>	109
— inconspicua, <i>Sm.</i>	109
— singularis, <i>Sm.</i>	109
Eumenidae	108
Eupetes	158
Eurylamidae	133, 160
Eutrygon	168
Falconidae	154
Formica gigas, <i>Latr.</i>	53
— compressa, <i>Latr.</i>	53
— stricta, <i>Jerdon</i>	53
— smaragdina, <i>Fabr.</i>	53
— festina, <i>Sm.</i>	53
— mistura, <i>Sm.</i>	53
— pilosa, <i>Sm.</i>	54
— ruficeps, <i>Sm.</i>	54
— badia, <i>Sm.</i>	54
— diligens, <i>Sm.</i>	55
— irritans, <i>Sm.</i>	55, 58
— ferrens, <i>Sm.</i>	55
— gracilipes, <i>Sm.</i>	55
— irritabilis, <i>Sm.</i>	56
— sedula, <i>Sm.</i>	56
— exasperata, <i>Sm.</i>	56
— tenuipes, <i>Sm.</i>	57
— camelina, <i>Sm.</i>	57
— pallida, <i>Sm.</i>	57
Formicariidae	133
Formicidae	52
Fringilla	135
Galbulidae	133
Garrulus	135
Gayella, <i>Sauss.</i>	108
— pulchella, <i>Sm.</i>	108
Gcoffroiis	165
Geopelia	168
Glarcola	169
Goura	167
Gracula	164
Grauculus	159

	PAGE
Gymnocorvus	162
Gyrecephala	18, 25
Hæmantopus	169
Haleyon	156
Haliastur	154
Haliehorre	154
Haliæctus, <i>Latr.</i>	42
— <i>ceratinus</i> , <i>Sm.</i>	42
— <i>vagus</i> , <i>Sm.</i>	42
— <i>basalis</i> , <i>Sm.</i>	43
Hedylærum, <i>Latr.</i>	128
— <i>orientale</i> , <i>Sm.</i>	128
Heptacondylus, <i>Sm.</i>	71
— <i>arachnoides</i> , <i>Sm.</i>	72
— <i>subearinatus</i> , <i>Sm.</i>	73
— <i>carinatus</i> , <i>Sm.</i>	73
Herodias	169
Hiaticula	169
Hierococcyx	166
Himantopus	169
Hirundinidæ	155
Hirundo	40, 155
Icaria, <i>Sauss.</i>	115
— <i>opulenta</i> , <i>Sm.</i>	115
— <i>speciosa</i> , <i>Sauss.</i>	115
— <i>ferruginea</i> , <i>Fabr.</i> (sp.)	115
— <i>lugubris</i> , <i>Sm.</i>	115
— <i>modesta</i> , <i>Sm.</i>	115
Ichneumon penetrans, <i>Sm.</i>	117
— <i>comissator</i> , <i>Sm.</i>	118
Ichneumonidæ, <i>Leach</i>	117
Ichthyaëtus	154
Icteridæ	133
Insectivora	22
Ischaogaster, <i>Guérin</i>	113
— <i>cilipennis</i> , <i>Sm.</i>	113
— <i>Mellyi</i>	113
— <i>nigritrons</i> , <i>Sm.</i>	113
— <i>micans</i> , <i>Sauss.</i>	111
Junco	134
Laniidæ	161
Lanius	134
Laridæ	170
Larra, <i>Fab.</i>	103
— <i>prismatica</i> , <i>Sm.</i>	103
Larrada, <i>Sm.</i>	102
— <i>exilipes</i> , <i>Sm.</i>	102
— <i>carbonaria</i> , <i>Sm.</i>	102
— <i>Sycorax</i> , <i>Sm.</i>	102
— <i>polita</i> , <i>Sm.</i>	102
— <i>Tisiphone</i> , <i>Sm.</i>	103
— <i>Alecto</i> , <i>Sm.</i>	103
Larridæ, <i>Leach</i>	101
Leucota	134
Lissancephala	14, 24
Lophorina	163
Lorius	165
Loxia	134
Lyencephala	14, 24
Macrogaster, <i>Brullé</i>	121

	PAGE
Macrogaster flavopictus, <i>Sm.</i>	121
Macromeris, <i>St. Farg.</i>	97
— <i>splendida</i> , <i>Sm.</i>	97
— <i>argentifrons</i> , <i>Sm.</i>	97
Macropteryx	155
Macropygia	168
Mammalia, Prof. Owen on the characters, principles of division, and primary groups of the	1
—, primary divisions of the	13
Manucodia	162
Marsupialia	21-35
Megachile, <i>Latr.</i>	45
— <i>atrata</i> , <i>Sm.</i>	45
— <i>ornata</i> , <i>Sm.</i>	45
— <i>umbripennis</i> , <i>Sm.</i>	45
— <i>amputata</i> , <i>Sm.</i>	45
— <i>tuberculata</i> , <i>Sm.</i>	46
— <i>architæta</i> , <i>Sm.</i>	47
— <i>luctuosa</i> , <i>Sm.</i>	46
— <i>rotundiceps</i> , <i>Sm.</i>	47
Megapodidæ	133, 168
Megapodius	169
Megaproctus, <i>Brullé</i>	119
— <i>ruficeps</i> , <i>Sm.</i>	119
Megischus, <i>Brullé</i>	120
— <i>insularis</i> , <i>Sm.</i>	120
Melanocharis (sp.)	157
Melanopyrrhus	159
Meleagrinae	133
Melidora	156
Meliplagidæ	133, 157
Mellinus, <i>Fabr.</i>	107
— <i>crabroniformis</i> , <i>Sm.</i>	107
Meranoplus, <i>Sm.</i>	81
— <i>castaneus</i> , <i>Sm.</i>	81
— <i>cordatus</i> , <i>Sm.</i>	82
— <i>mueronatus</i> , <i>Sm.</i>	82
Meropidæ	133
Microdus, <i>Esenbeck</i>	127
— <i>apicalis</i> , <i>Sm.</i>	127
Microglossa	166
Mimeta	159
Monotidæ	133
Monarcha	160
Monodelphes	10
Monotremata	21, 35
Muscicapidæ	133, 160
Musophagidæ	133
Mutica	10
Mutilata	25
Mutilla, <i>Lin.</i>	83
— <i>blanda</i> , <i>Sm.</i>	83
— <i>representans</i> , <i>Sm.</i>	83
— <i>Deidamia</i> , <i>Sm.</i>	83
— <i>Urania</i> , <i>Sm.</i>	83
— <i>suspiciosa</i> , <i>Sm.</i>	84
— <i>gracillima</i> , <i>Sm.</i>	84
— <i>familiaris</i> , <i>Sm.</i>	84

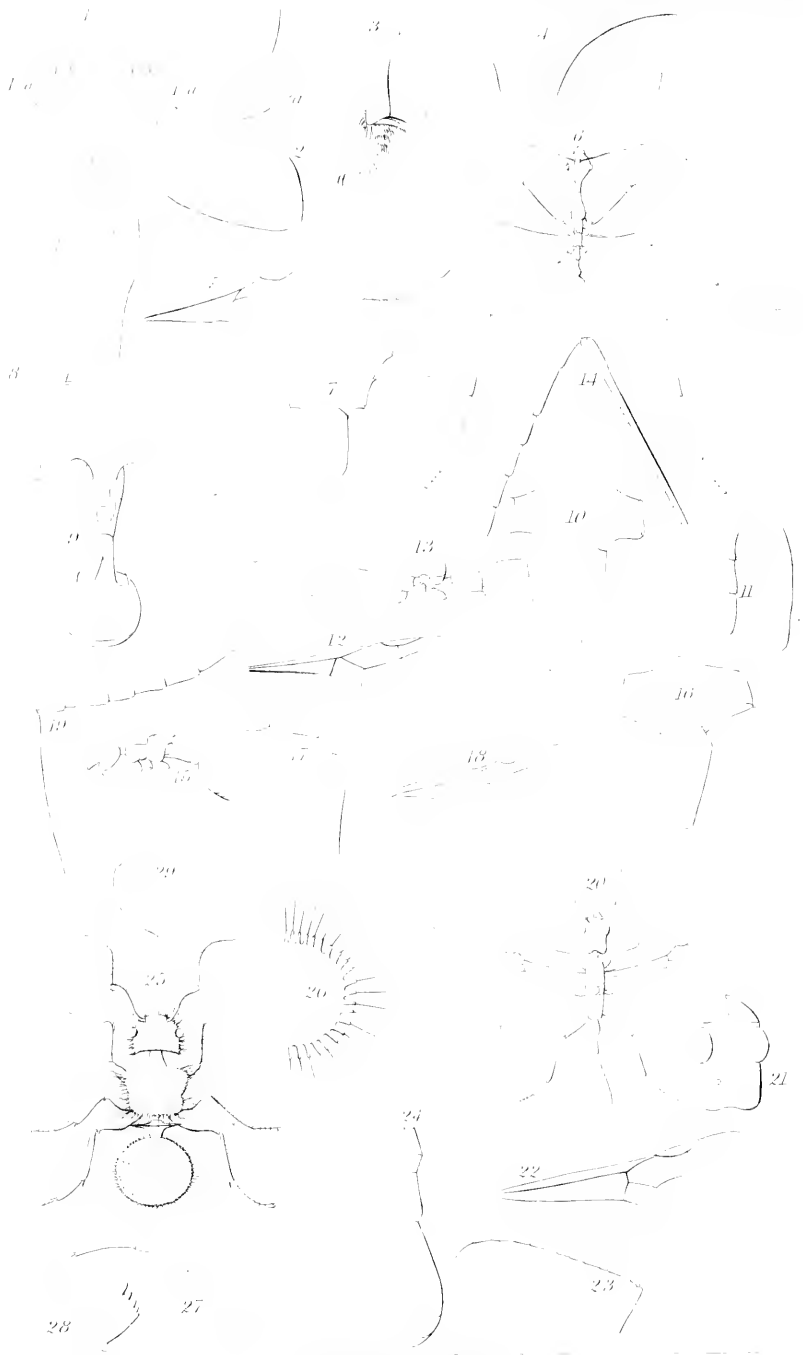
	PAGE
Mutilla Calloipe, <i>Sm.</i>	85
— Proserpina, <i>Sm.</i>	85
— Pandora, <i>Sm.</i>	85
— Sibylla, <i>Sm.</i>	86
— Cassiope, <i>Sm.</i>	86
— Dardanus, <i>Sm.</i>	86
— unimaculata, <i>Sm.</i>	87
Mutillidæ	83
Mygminia, <i>Sm.</i>	97
— flava, <i>Fabr.</i> (sp.)	97
— anthracina, <i>Sm.</i>	97
— ducalis, <i>Sm.</i>	98
— princeps, <i>Sm.</i>	98
— iridipennis, <i>Sm.</i>	98
Myiolestes	161
Myrmecidæ (Subfam.)	70
Myrmica, <i>Latr.</i>	70
— longipes, <i>Sm.</i>	70
— pellucida, <i>Sm.</i>	71
— vastator, <i>Sm.</i>	71
— agilis, <i>Sm.</i>	71
Myrmosida, <i>Sm.</i>	87
— paradoxa, <i>Sm.</i>	88
Myzine, <i>Latr.</i>	91
— tricolor, <i>Sm.</i>	91
Nasiterna	166
Nectarinia	157
Nectariniidæ	157
Nestor	132
Nomia	43
— apicalis, <i>Sm.</i>	43
— iridescens, <i>Westw.</i>	43
— elegans, <i>Sm.</i>	44
Numenius	170
Odontomachus, <i>Latr.</i>	64
— rixosus, <i>Sm.</i>	64
— rugosus, <i>Sm.</i>	65
Odontophorinæ	133
Odynerus, <i>Latr.</i>	110
— flavo-lineatus, <i>Sm.</i>	110
— manifestus, <i>Sm.</i>	110
— septemfasciatus, <i>Sm.</i>	111
— maculipennis, <i>Sm.</i>	111
— multipictus, <i>Sm.</i>	112
— latipennis, <i>Sm.</i>	112
Ophion, <i>Fabr.</i>	121
— iridipennis, <i>Sm.</i>	121
— vestigator, <i>Sm.</i>	122
Opisthocomidæ	133
Oriolidæ	159
Ornithodelphes	10
Pachycephala	161
Paradigalla	164
Paradiseidæ	133, 152, 162
Paradisca	162, 163
Parotia	163
Parra	170
Parus	131, 135
Pelopæus, <i>Latr.</i>	101
— javanus, <i>St. Farg.</i>	101

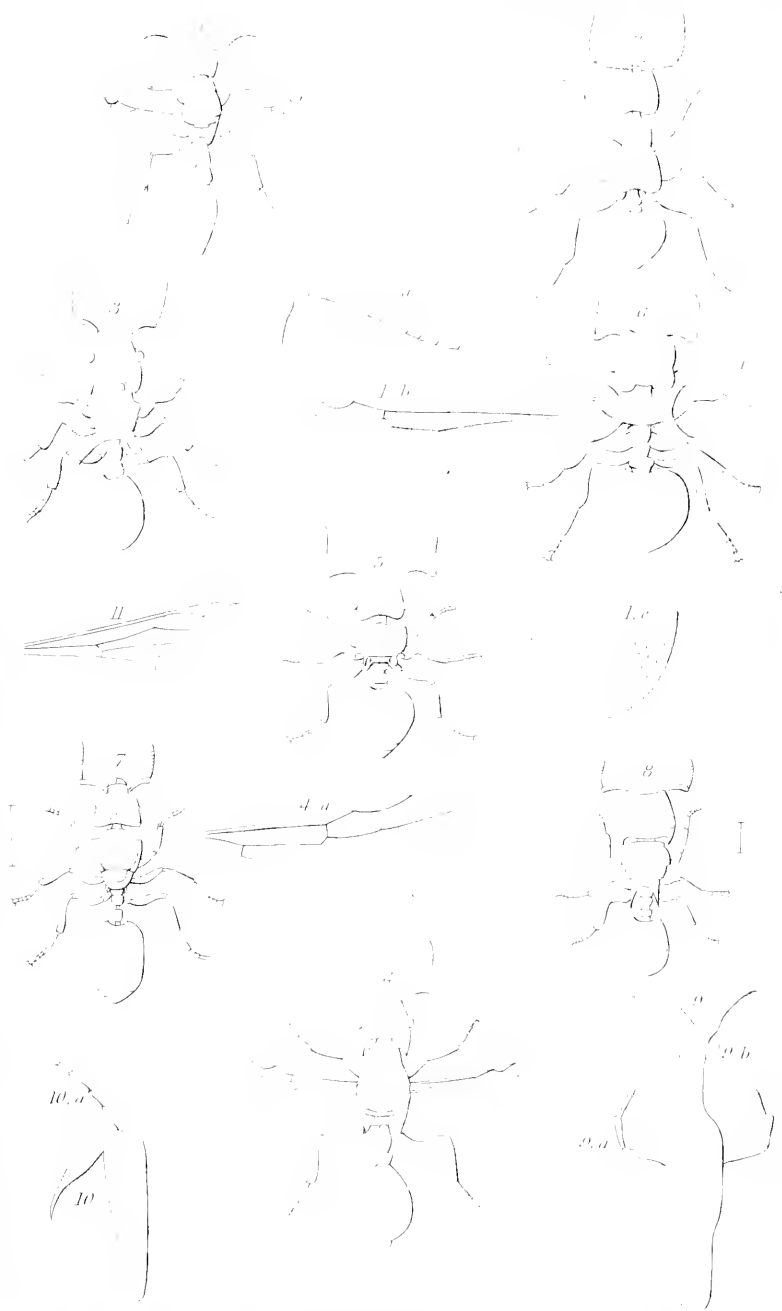
	PAGE
Pelopæus fervens, <i>Sm.</i>	101
Peltops	160
Perameles	154
Perdicinæ	133
Perisorcus	134
Perissodactyla	27
Phaseogale	154
Phasianidæ	133, 140
Phyllosoma commune, Mr. Couch on the occurrence of	146
Physatta, <i>Sm.</i>	77
— dromedarius, <i>Sm.</i>	78
Pica	134
Picus	135
Pimpla, <i>Fabr.</i>	119
— punctator, <i>Linn.</i> (sp.)	119
Pison, <i>Spin.</i>	104
— suspiciosus, <i>Sm.</i>	104
Pisonoides (Subgen.), <i>Shuck.</i>	104
— obliteratus, <i>Sm.</i>	104
Pitta	158
Plantigrada	31
Plectrophanes	134
Podargus	155
Polistes, <i>Latr.</i>	113
— sagittarius, <i>Sauss.</i>	113
Polybia, <i>Sauss.</i>	113
— sumatrensis, <i>Sauss.</i>	113
— Stigma, <i>Sm.</i>	114
— luctuosa, <i>Sm.</i>	114
— decorata, <i>Sm.</i>	114
Polychlorus, <i>Sm.</i>	165
Polyrhachis, <i>Sm.</i>	58
— bihamatus, <i>Drury</i>	59
— relucens, <i>Latr.</i> (sp.)	59
— carinatus, <i>Latr.</i> (sp.)	59
— defensus, <i>Sm.</i>	59
— constructor, <i>Sm.</i>	60
— ruficornis, <i>Sm.</i>	60
— carbonarius, <i>Sm.</i>	60
— chalybeus, <i>Sm.</i>	61
— nitidus, <i>Sm.</i>	61
— villipes, <i>Sm.</i>	61
— modestus, <i>Sm.</i>	62
— Pandarus, <i>Sm.</i>	62
— Hector, <i>Sm.</i>	62
— lævigatus, <i>Sm.</i>	62
— cuspidatus, <i>Sm.</i>	63
— flavicornis, <i>Sm.</i>	63
— equinus, <i>Sm.</i>	63
— dives, <i>Sm.</i>	64
— vindex, <i>Sm.</i>	64
Pomatorhinus	158
Pompilidæ	91
Pompilus, <i>Fabr.</i>	91
— leucophæus, <i>Sm.</i>	92
— vagabundus, <i>Sm.</i>	92
— pulverosus, <i>Sm.</i>	93
Ponera, <i>Latr.</i>	65
— versicolor, <i>Sm.</i>	65

	PAGE		PAGE
<i>Ponera rubra</i> , <i>Sm.</i>	66	<i>Sitta</i>	134
— <i>apicalis</i> , <i>Sm.</i>	66	<i>Sphegidae</i>	98
— <i>iridescentis</i> , <i>Sm.</i>	66	<i>Sphex</i> , <i>Fabr.</i>	100
— <i>rugosa</i> , <i>Sm.</i>	66	— <i>sericea</i> , <i>Sm.</i>	100
— <i>rufipes</i> , <i>Sm.</i>	67	— <i>nigripes</i> , <i>Sm.</i>	100
— <i>intricata</i> , <i>Sm.</i>	67	— <i>diabolicus</i> , <i>Sm.</i>	100
— <i>geometrica</i> , <i>Sm.</i>	67	<i>Spiloglaux</i>	155
— <i>transversa</i> , <i>Sm.</i>	68	<i>Sterna</i>	170
— <i>vidua</i> , <i>Sm.</i>	68	<i>Strepsilas</i>	169
— <i>diminuta</i> , <i>Sm.</i>	69	<i>Strigidae</i>	165
— <i>pompiloides</i> , <i>Sm.</i>	69	<i>Struthionidae</i>	168
— <i>laviceps</i> , <i>Sm.</i>	69	<i>Sturnidae</i>	133, 164
<i>Poneridae</i> (Subfam.)	64	<i>Sus</i>	153
<i>Priocnemis</i> (Subgen.), <i>Schödlte</i>	93	<i>Sylvicolae</i>	142
— <i>sericosoma</i> , <i>Sm.</i> (sp.)	93	<i>Tachytes</i> , <i>Panzer</i>	101
— <i>optimus</i> , <i>Sm.</i>	93	— <i>nitidulus</i> , <i>Fabr.</i> (sp.)	101
— <i>verticalis</i> , <i>Sm.</i>	94	— <i>argentatus</i> , <i>Brullé</i> (sp.)	101
<i>Promeropidae</i>	133	— <i>aurifex</i> , <i>Sm.</i>	101
<i>Psittacidae</i>	164	<i>Talegalla</i>	168
<i>Psittacodis</i>	165	<i>Tanysiptera</i>	156
<i>Pterocrythrurus</i>	161	<i>Tapinoma</i> , <i>Foerster</i>	58
<i>Pteroclididae</i>	133	— <i>glabrata</i> , <i>Sm.</i>	58
<i>Ptiladela</i>	160	<i>Tchitrea</i>	161
<i>Ptilonopus</i>	167	<i>Tenthredinidae</i> , <i>Leach</i>	116
<i>Ptilorhis</i>	164	<i>Tenthredo coxalis</i> , <i>Sm.</i>	116
<i>Ptilotis</i>	157	<i>Tetraponera</i> , <i>Sm.</i>	70
<i>Quadrumana</i>	32	— <i>atrata</i> , <i>Sm.</i>	70
<i>Rallidae</i>	170	<i>Thaumantias achroa</i>	38
<i>Rectes</i>	161	<i>Tinamidae</i>	133
<i>Regulus</i>	134	<i>Tiphia</i> , <i>Fabr.</i>	90
<i>Rhamphastidae</i>	133	— <i>stigma</i> , <i>Sm.</i>	91
<i>Rhipidura</i>	161	— <i>flavipennis</i> , <i>Sm.</i>	91
<i>Rhynchium</i> , <i>Spinola</i>	110	<i>Todidae</i>	133
— <i>haemorrhoidale</i> , <i>Fabr.</i> (sp.)	110	<i>Toxodontia</i>	26, 35
— <i>sanguineum</i> , <i>Sauss.</i>	110	<i>Tremex</i> , <i>Jurine</i>	117
— <i>metallicum</i> , <i>Sauss.</i>	110	— <i>insularis</i> , <i>Sm.</i>	117
— <i>nitidulum</i> , <i>Fabr.</i> (sp.)	110	<i>Trichoglossus</i>	164
— <i>obscurum</i> , <i>Sm.</i>	110	<i>Trigona</i> , <i>Jurine</i>	50
<i>Rhyssa</i> , <i>Grav.</i>	120	— <i>ventralis</i> , <i>Sm.</i>	50
— <i>mirabilis</i> , <i>Sm.</i>	120	— <i>atripes</i> , <i>Sm.</i>	50
— <i>maculipennis</i> , <i>Sm.</i>	120	<i>Tringoides</i>	170
<i>Rodentia</i>	22	<i>Tririgma</i> , <i>Westw.</i>	99
<i>Ruminantia</i>	29	— <i>aerulea</i> , <i>Westw.</i> (sp.)	99
<i>Schœnichus</i>	170	— <i>prismatica</i> , <i>Sm.</i>	99
<i>Scolia</i> , <i>Fabr.</i>	88	<i>Trochilidae</i>	133
— <i>erratica</i> , <i>Sm.</i>	88	<i>Tropidorrhynchus</i>	158
— <i>aureicollis</i> , <i>Sm.</i>	88	<i>Trypoxylon</i> , <i>Latr.</i>	105
— <i>grossa</i> , <i>Sm.</i>	88	— <i>bicolor</i> , <i>Sm.</i>	105
— <i>Iris</i> , <i>Sm.</i>	88	— <i>petiolatum</i> , <i>Sm.</i>	105
— <i>patricialis</i> , <i>Burm.</i>	89	— <i>coloratum</i> , <i>Sm.</i>	106
— <i>rubiginosa</i> , <i>Fabr.</i>	89	<i>Turdidae</i>	158
— <i>cineta</i> , <i>Sm.</i>	89	<i>Typhlatta</i> , <i>Sm.</i>	79
— <i>procera</i> , <i>Fabr.</i>	89	— <i>laviceps</i> , <i>Sm.</i>	79
— <i>opalina</i> , <i>Sm.</i>	89	<i>Typhlopone</i> , <i>Westw.</i>	70
— <i>speciosa</i> , <i>Sm.</i>	90	— <i>laevigata</i> , <i>Sm.</i>	70
<i>Scoliidae</i>	88	<i>Tyrannidae</i>	133
<i>Scelopacidae</i>	169	<i>Unguiculata</i>	10-25
<i>Scopalipedes</i> (Subfam.)	47	<i>Ungulata</i>	10-25, 26
<i>Seleucides</i>	163	<i>Upupidae</i>	133
<i>Sirenia</i>	26, 35	<i>Vespa</i> , <i>Linn.</i>	116

	PAGE		PAGE
<i>Vespa cincta</i> , <i>Fabr.</i>	116	<i>Xylocopa collaris</i> , <i>St. Farg.</i> . .	47
— <i>affinis</i> , <i>Fabr.</i>	116	— <i>æstuans</i> , <i>Linn.</i> (sp.) . . .	47
— <i>tyrannica</i> , <i>Sm.</i>	116	— <i>verticalis</i> , <i>St. Farg.</i> . . .	48
— (<i>anomala</i>) <i>dorylloides</i> , <i>Sauss.</i>	116	— <i>cærulea</i> , <i>Fabr.</i>	48
— <i>bellicosa</i> , <i>Sauss.</i>	116	— <i>Dejeanii</i> , <i>St. Farg.</i> . . .	48
— <i>annulata</i>	116	— <i>dissimilis</i> , <i>St. Farg.</i> . . .	48
<i>Vespidae</i>	113	— <i>insularis</i> , <i>Sm.</i>	48
<i>Xanthomelus</i>	159	<i>Xylonomus</i> , <i>Grav.</i>	122
<i>Xylocopa</i> , <i>Latr.</i>	47	— <i>fulgidipennis</i> , <i>Sm.</i>	122
— <i>latipes</i> , <i>Drury</i> (sp.) . . .	47	<i>Zonotrichiæ</i>	142

THE END.







Date Due

--	--

